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The Mixed Garden of the Sinhalese Villager.

One of the most characteristic features in Ceylon agriculture is what may be termed the villager's "mixed garden," to be seen everywhere in and around Colombo for example. Upon the ground round his house he grows a miscellaneous assortment of trees and shrubs and a few herbs, and allows cattle to graze upon the grasses and weeds that grow in between these plants. Coconuts are the most constant components of the mixture, but areca-palms, kituls, mangoes, jaks, bamboos, breadfruit, talipots, silk-cottons, castor-oil, coffee, papaws, oranges, yams, &c., &c., are also usually to be seen. All these are planted just as they come, with no arrangement, too closely together; they are never cultivated, but left to take care of themselves.

In general, therefore, the yields are extremely small, the plants are of the poorest kinds, and there is little variety from one place to another. On the other hand, almost no labour is required, diseases do not readily spread, and the soil is not quickly exhausted, the different plants taking food materials in different proportions, so that the available food lasts longer.

Apart altogether from the complications introduced by multiple ownership, the mere existence of these gardens forms one of the greatest obstacles to agricultural progress in the island. All the land as a rule is taken up by these gardens or by rice fields, in the densely peopled parts where alone is agricultural progress likely to go on (for other reasons). The villager has no land to try other crops upon, even had he the capital. He will not cut down his mixed garden, nor will he do much to cultivate it. Only where there is chena or unoccupied high land can he be expected to do much in the way of experiment with new products or methods.

GUMS, RESINS, SAPS AND EXUDATIONS.

MGOA RUBBER IN BRITISH EAST AFRICA.

(*Mascarenhasia elastica, K. Sch.*)

By Otto Stapf.

Mr. E. Battiscombe, Acting Conservatator of Forests at Nairobi, B.E.A., communicated recently specimens of flowers and fruits of a rubber tree found by him in the Shimba Hills, near Mombasa. On comparison they proved to belong to *Mascarenhasia elastica*, K. Sch., a species previously known only from the neighbourhood of Dar-es-Salam, German East Africa, where it is worked occasionally by the natives for a kind of ball rubber called Mgoa rubber in the Zanzibar trade.

Mascarenhasia elastica was discovered by Dr. Stuhlman in 1898 near Dar-es-Salam, and described and figured by the late Dr. Schumann in the Notizblatt of the Berlin Botanic Garden and Museum, vol. 1, (1899), pp. 268-270. This is what the author says of it as a rubber tree: "Between the villages of Vikindo and Mbaffu there grows in moist places a robust tree which contains rubber latex and yields a superior kind of caoutchouc. The trunk branches usually low down and attains a height of 10m. The pale grey bark is covered with scars from the knives of the rubber collectors, who produce from it large balls of rubber known as Mgoa in the Zanzibar trade. It is not particularly pure, containing fragments of bark, etc." Samples of this rubber received at the Botanic Museum, Berlin, are described by Dr. Warburg (Der Tropenflanzer, III., p. 220) as consisting of pale brown drawn-out caoutchouc threads intermixed with small particles of caoutchouc. In 1899 Herr Hedde, Government Gardener at Dar-es-Salam, was commissoned to explore the neighbourhood of Dar-es-Salam and to study the distribution and properties of the tree. Dr. Schumann published an abstract from Hedde's official report in the Notizblatt of the Botanic Garden and Museum at Berlin, vol. III., p. 43. According to it *Mascarenhasia elastica* is fairly common in the district visited by Hedde along streams as well as over underground water.

It makes fine smooth and straight trunks which are much sought for by the natives, who use them in building their shambas. On the other hand Hedde found the flow of latex too slow to make collecting profitable. He further adds that the rubber produced does not sell well, possibly, as he says, on account of the crude mode of preparation. Attempts to take *Mascarenhasia elastica* into cultivation have been so far successful, as the plants grew fast even in dry soil, and flowered and fruited in their fifth year; but the flow of latex at that age was far too scanty (Der Tropenflanzer, X., p. 44).

As other species of *Mascarenhasia*, natives of Madagascar are said to produce fairly good rubber, known as "Black Madagascar" (Madagascar noir), it was desirable to have an exact analysis of Mgoa rubber. This was made at the Imperial Institute from a sample communicated by Mr. Battiscombe last February to that establishment. Thanks to the courtesy of the Director of the Imperial Institute, we are able to publish the results of the examination of the sample mentioned.

Report on the Composition of the Rubber from the Shimba Hills, by the Director of the Imperial Institute.

Mark and Weight of Sample.—"Rubber from Shimba Hills, East Africa Protectorate," 104 grams.

Description.—Single ball of rubber, about 2¼" in diameter, evidently formed by winding threads of rubber upon a central mass; it was light brown, and contained a considerable quantity of vegetable impurity. The rubber was fairly strong.

Results of Examination:—

	Samples as received.	Composition of dry rubber.
	%	%
Moisture	10·0	—
Caoutchouc	69·0	76·6
Resin	6·1	6·8
Proteids	3·5	3·9
Insoluble matter ...	14·4	12·7
Ash	2·29	2·54

Commercial Value.—3s. 6d. per lb. in London. The current price of fine hard Para from South America was 5s. 2d. per pound.

Remarks.—The sample has the usual appearance of Landolphia rubber; it is of very fair quality, though the amount of insoluble matter is rather high. This defect could be remedied by careful collection, so as to exclude, as far as possible, fragments of bark from the rubber.

Consignments of this rubber, if well prepared, would be readily salable at satisfactory prices.

Since the above was written a specimen of *Mascarenhasia elastica* has been received from the Uganda and British East Africa Exploration Syndicate, accompanied by a short note by Mr. Henry Dalziel, who reports:—"The enclosed specimens of leaves, fruit, and wood are from a new kind of rubber tree, lately discovered by the natives in Wanga District, British East Africa, and called by them "Goa." This tree is generally found on the banks or near the sides of running streams where its root can get easy access to the water. The stems are from a few to 18 inches in diameter, and form a bole 20 feet high to where it branches out. In old trees the bole has generally a great number of hollows, with a rough scaly bark which can easily be rubbed off; the inner bark is a quarter of an inch thick, and easy to cut. When the tree is cut the latex oozes out very slowly."

A specimen of the wood of *Mascarenhasia elastica* from the Wanga District, collected by Mr. H. Dalziel, is exhibited in Case 78, Museum No 1.—*Royal Botanic Gardens, Kew Bulletin of Miscellaneous Information*, No. 7, 1907.

GUAYULE RUBBER.

(*Parthenium argentatum.* A. Gray.)

By J. M. Hillier.

Among the plants of economic value belonging to the natural order Compositæ none are more interesting than those known to contain rubber or a substance analogous to rubber. During the last decade considerable attention has been directed to two such plants of this order, viz., the Colorado Rubber Plant (Hymenoxys sp.), a note on which appeared in Kew Bulletin, 1906, No. 6, pp. 218, 219, and the Guayule of Mexico, the subject of the present note. The first communication received at Kew on the subject of Guayule was from the Mexican Land and Colonization Co. Ltd., 4, Moorate Street, E.C., dated 29th December, 1902, requesting information regarding the following extract from Circular No. 28 issued by the United States Department of Agriculture:—

"An illustrative instance of the dangers likely to beset investments in rubber comes to hand as this Circular is being sent to the printer. A well-known Journal* notices a new substitute for rubber, describing it as a gum obtained by grinding up the bark and 'comparatively hard wood' of a 'small scrubby bush,' and then macerating in gasoline or other hydrocarbon solvent. 'By this process the gum that comes out is chemically pure and suitable at once for manufacture, and it forms a new composition consisting of resin of the plant combined with a residual portion of the hydrocarbon solvent.' The shrub, which has no milky juice, is said to grow in abundance on the 'rolling land' of Central Mexico, is really propagated, may be cut two or three times a year, may be treated when fresh, or dried for export, and yields by weight forty per cent. of a gum 'superior to most india rubber,' and having the additional advantages of abundance, cheapness and ease of manipulation.

"The Indian name is said to be 'Yule' already known in application to Castilloa, while the scientific designation *Synathereœas Mexicanus*, seems to have been unfortunately chosen, since the genus Synantherias, which has the only similar name known to botanists, is a member of the Aroid family. 'Moreover it is by no means clear how the 'comminuted shrub' without other provision than straining through a canvas bag, for the separation of the 60 per cent. of waste matter, can be expected to issue in the 'chemically pure' condition, since the oils, fats, resins, and many other vegetable substances would be incorporated by the solvent. Neither could such a process be carried out on fresh material, the water of which would prevent the action of the solvent. Similar inaccuracies are frequent in claims and applications for patents for artificial rubber substitutes, the published accounts of which are sometimes intended to draw public attention without unduly enlightening trade competitors. Naturally the knowledge of any such new source of wealth, or of a process by which a hitherto worthless natural product may be exploited, generally results in the greatest secrecy on the part of the first possessors of the information.' The passage doubtless refers to the Guayule, the name *Synathereœas Mexicanus* being probably

* "Scientific American."

intended for *Sinantereas Mexicanus*, *i.e.*, Mexican Compositæ.

In January, 1905, a correspondent forwarded for identification a small section of a stem to which in a subsequent letter he gave the name "Guala guayala," stating that he had found that 5 per cent. of the bark consisted of rubber of fair quality, but that he could get nothing for the wood, and that after a further examination of the so-called rubber, he believed that it was useless for any commercial purpose. This stem was determined as being that of *Parthenium argentatum*, A. Gray, a full account of which appeared in Der Tropenflanzer for May, 1905, and again in the Bulletin of the Imperial Institute for 1906, p. 114. The first identification of Guayule with *Parthenium argentatum* appeared in Bull. du Jard. Colon., No. 1, July-August, 1901, p. 105. In the course of the present year further information with regard to Guayule has become available, and is summarized in the paragraphs that follow.

On January 23rd, 1907, the following memorandum of Guayule, prepared by Mr. W. G. Max Müller, His Majesty's Chargé d'Affaires in Mexico, dated December 3rd, 1906, was transmitted to Kew from the Colonial Office for observation on the question of introducing the plant into the Colonies :—

"In my Report on the Mexican Budget for the current fiscal year (Annual Series, No. 3693, p. 9), I referred to the imposition of an export duty on Guayule." 'Guayule' is a form of rubber extracted from the Guayule plant, which grows in enormous quantities in certain of the Northern States of Mexico, especially San Luis Potosi, Zacatecas, Durango and Coahuila. The name appears to be a local term and is found in none of the Spanish Dictionaries. It must be a compound formed from 'hule,' *i.e.*, rubber. The Guayule industry is now passed from the experimental to the practical stage, and is destined to attain considerable importance in Northern Mexico, and under these circumstances I feel that the following information which I have collected regarding this new industry may be of interest.

Little more than two years ago the Guayule shrub was not only regarded as worthless, but was looked on as a veritable scourge by the Mexican landowners. In fact, lands thick with this bush were considered worse than useless, and could have been had for a merely nominal sum, while now many sales of Guayule on the ground have been reported at over five times the price at which the land itself was valued two or three years ago. Holders of tracts of these lands, who had to expend money on them for taxes and other purposes, found them burdensome in the extreme. Now many of these people have reaped fortunes from those same waste lands. For some years 'Guayule' had been known to contain rubber, but it is only within quite a short time that a process has been invented for the extraction of the gum for commercial use. As long ago as 1897, a German named Henry Lemcke, employed under the Mexican Ministry of Formento, acquired a knowledge of the value of the Guayule plant, known then only to the Indians and a few others who discovered an elastic substance in the plant when chewing it. Mr. Lemcke informed the Mexican Government of his discovery, and also offered it to various companies interested in the rubber industry, with a view to ascertaining whether it was possible to extract a good quality of rubber from the shrub. Chemists and inventors began experimenting with the plant, but it was not really till towards the end of the year 1904 that the buying of the shrub began at about $15 Mexican per ton. Speculation immediately began, and such was the number of persons anxious to secure quantities of Guayule large enough to justify them in erecting factories for applying the recently discovered processes of the extraction of the gum, that buyers have found it very difficult to purchase the plant, and recently contracts for large lots have been reported as high as $100. per ton. It is not to be expected that the gum extracted from the Guayule will ever take the place of rubber, but it can be used as a substitute in many forms of manufacture, especially in a vulcanised form, and can be mixed in large propotions with rubber. In itself, it is inferior to real rubber, it has very little elasticity and will not bound as true rubber does, and is easily broken. It contains a great deal of soft, sticky matter. Fresh Guayule looks very much like old rubber which has been exposed to the air for years until it has lost its elasticity and strength. It requires therefore a considerable admixture of ordinary rubber to give it strength enough for common commercial purposes. It has the further disadvantage that it deteriorates more rapidly than real rubber. Various extraction processes have been, and are still being, registered at the Mexican Patent Office, but none of these processes have as yet attained to any degree of perfection, as the known results vary from 10 to 12 per cent., whereas the quantity of gum contained in the shrub is known to be approximately 18 per cent. The quality

obtained can better be judged by the price realized for the product of the various processes, which varies from 25 to 50 cents gold per pound on the New York market. There is still considerable difficulty in removing certain foreign substances and producing a pure rubber free from resin. However, a better finished product is gradually being produced, and I am informed that a sample lot of such excellent quality has been extracted by a new process still in the experimental stage, and not yet patented, that it fetched $1 gold per lb.

Numerous companies for the extraction of the gum from the Guayule plant have been formed, and many of them are so flourishing that big Corporations are active in securing control of the product. Factories have sprung up all over the North of Mexico, and already represent an outlay of many millions of dollars in buildings and machinery alone. The Continental Rubber Co., of America, has large holdings of Guayule lands in Mexico. It is estimated that it has $9,000,000 Mexican invested in Guayule lands and factories in the country, and the output from its three factories at Torreon, Ocampo, and Saltillo is said to be in the neighbour of 500,000 pounds per month. In addition to this there are, I am informed, twelve other large firms engaged in the trade, not to mention smaller factories. There are various processes of extracting the gum already patented, the best known being the Pablo Bergner, the Garza, the Delafond, the Lawrence, and the Hunieke processes, but none of them seem to be satisfactory so far. As I before said, the shrub is known to contain as much as 18 per cent. of rubber, but none of the present processes seem to furnish better results than 10 or 12 per cent., *i.e.*, a ton of the plant produces about 240 pounds of rubber. The cost of extraction is said to be about 10 cents Mexican a pound, and the price of a ton of the plant has never yet exceeded $100 Mexican, and is generally less. Then there is the cost of freight to the factory, which is in some cases very heavy, and certain other incidental expenses to be deducted. The price of Guayule rubber in New York has been as high as 75 cents gold, and in the summer went as low as 25 cents gold, owing to the action of the Continental Rubber Co. of America, but it has now attained again to 45 cents gold, so that even at the lowest price there is a handsome profit to be reaped in Guayule. The actual cultivation of the Guayule plant is still a problem, but it will be some time before the existing supply of Guayule is exhausted from the prairies of Northern Mexico, where it grows in such abundance. I have, in fact, seen it stated that the value of the Guayule lands in Mexico is not less than $30,000,000 Mexican, and that the Guayule lands of one man, Salvador Madero, in the State of Coahuila are worth over $40,000,000 Mexican. These valuations may be, and probably are, exaggerated, due to the mad speculation that has been taking place in Guayule, and which sent up the price per ton from $15 to $100 Mexican. That these prices will continue appears improbable, but in the opinion of those best qualified to judge, the Guayule industry in Mexico will have a great future if the landowners are sensible and do not ask exorbitant prices, and, above all, if they discover the secret of the planting and cultivation of the shrub. At present no one knows exactly how long it will take to raise Guayule shrubs, though the Department of Fomento is actively persuing experiments to discover the best method of cultivating them. The price of Guayule actually depends on the price of rubber, and if there were no other considerations to be taken into account but the world's demand for rubber, the future of the Guayule interests would be assured. The rubber market, however, is controlled by the great American Companies, the Consolidated Rubber Company, and the United States Rubber Company. The former Company, which was organised last January, is supposed to control the stock of various subsidiary Companies interested in Guayule. Experiments are being conducted with the Guayule plant with a view to utilizing as fuel the refuse left over after the rubber has been extracted. If these experiments are successful, there will be a considerable reduction in the cost of manufacture. The northern part of Mexico is not the only country where Guayule grows. There are millions of acres in Texas covered with the shrub, which has lately also been discovered in the Philippines.

Extreme caution is necessary in dealing with this subject, as the supplanting of the usual rubber of commerce of the gum of various herbs, vines, &c., has often led to rather wild speculations, not borne out by later practical results. In the foreign office report referred to by Mr. Max Müller, it is stated under the heading of "Export Duties," that "the total increase of about £7,000 under this heading is almost entirely due to the duty which, in the present Budget Bill, is for the first time to be imposed on Guayule, a form of Cactus extract which is now used and exported in considerable quantities for mixing with rubber."

A memorandum on the Guayule, prepared at the instance of H. M. Envoy Extraordinary and Minister Plenipotentiary, Mexico, by Mr. Vice-Consul Kennedy, on information furnished to him by Mr. Adolph Marx, the manager of a Mexican company for the export of this rubber, was forwarded to Kew from the Foreign Office, on March 22nd, 1907, together with specimens of plants of Guayule, determined as *Parthenium argentatum*, and of the Mariol *P. incanum*, a species apt to be confused with Guayule. From this memorandum it appears that "the first shipments of Guayule rubber to Europe (1902) were received with scant favour, and the shippers were extremely glad to at last get an offer from a London firm of 6d. per pound. A few months later a German manufacturer offered 1s. per lb. for the rubber, whilst an American offered 25 cents gold per lb. At the beginning of 1903 the same American offered to take the whole output of the factory at 40 cents per lb. Since that date, as manufacturers have become accustomed to this rubber, the price has steadily advanced until 1906, when the highest price was reached, viz., 2s. 9d. per lb. Guayule or the *Parthenium argentatum* is a shrub growing to about 3 feet high at maturity. It is of very slow growth, and the samples accompanying this memorandum are probably at least 30 years old. From the first year, when only about 6 inches high, and with a very thin stem, it gives both flowers and seed, and so on every year, and as it cannot be used for extracting rubber until the eighth year, this gives the plant ample time to produce, the seed being blown about by the wind. Up to the third year the plant contains no rubber whatever, and from the third to the eighth year the percentage of rubber is small. A good well-matured plant will contain as much as 10 per cent. of its height in rubber. The best process for extraction is that originally employed by the Anglo-American Co, viz., maceration of the plant, and extraction of the rubber by steaming in an alkaline solution. Unless the shrub is recently taken from the ground, the quality and quantity of rubber obtained is inferior. From several factories in operation, and one in course of construction, the estimated total production from all sources will not be less than 300 tons per month. At present there is sufficient raw material in sight to supply all these factories for several years, say three or four, but there is no plantation of Guayule to make good the plants used up; it is only a question of time when this source of rubber will be almost entirely exhausted. The Guayule shrub is only found in the colder parts of the Republic, and is not met with the south of the Tropic of Cancer. It is principally obtained from the States of Zacatecas and San Luis Potosi. Mariola is another shrub which can only be mistaken for Guayule from the similarity of the colour of its leaves, &c., especially in the wet season. It grows in the same region as the Guayule. The Mariola also contains rubber, but in such small quantities that it is not worth while to extract it. According to "The Mexican Investor" of March 23rd, 1907, it appears that during the year 1905 a factory in Germany, backed by large financial interests, for the extraction of rubber from Guayule, experienced its most profitable run. The shrub was bought, baled, and shipped by Mr. Oton Ketterfeld, who traversed most of the interior where Guayule was known to grow, and who secured many thousand tons at prices that look ridiculously low at the present time. This German enterprise was kept very quiet, and must have made much money, until in September the Mexican Government put an export duty of 15 pesos a ton on the shrub which, with the freight rates, made further shipments unprofitable. The following article, from the pen of Dr. P. Olsson-Seffer, Director of the Zacualpa Botanical Station and Rubber Laboratory in the Republic of Mexico, which appeared in a recent number of "The Mexican Investor" sums up the present prospects of the Guayule industry. The supply of Guayule has been greatly overestimated, principally because of the confusing of Guayule with another species of the same genus, *Parthenium incanum*, H. B. K., which is far more abundant and grows all through the Guayule territory. This has been estimated to as much as 28,000 square miles, but it must be remembered that the patches of Guayule are far apart, and one can travel over miles in the Guayule country without seeing a single specimen. The general estimate of Guayule on the acre is from 400 to 700 lbs. taking an average for large areas. This is undoubtedly too high an average. By actual count in very favourable localities I have become convinced that even under the best conditions not more than 1,500 pounds can be obtained per acre from the Guayule patches, and these constitute less than one-tenth of the total area of the territory, where the plant occurs. That my estimate in this regard is upheld by others who have investigated the matter and expressed an unbiased opinion is shown by the following lines, translated from an article by Dr. Endlich, in *Der Tropenflanzer*, 1905, pp. 233-247. The author says in part:—

"The supply of the Guayule is very unevenly distributed in the territory the plant occupies. In most places the plants are isolated, growing sometimes in large an often in small numbers among the other plants. At rare intervals small patches are found where it is predominating in the chaparral flora. It is very difficult to make an estimate of the average supply per hectare, both on account of the uneven distribution of the plant and because of the difference in size of individual specimens. In favourable territory I have on several occasions counted thirty to forty plants on an area of 100 square meters, which would mean a total supply of 3,000 to 4,000 Guayule plants per hectare (=1,215 per acre). The differences between the size and the weight are so great that in places where the plants are small and grow close together ten plants have a weight of only one kilogram (=$2\frac{1}{5}$ lbs.), while in the best territories some of the trees weigh as much as 3 kilograms each. The average weight will probably not exceed 500 grams ($1\frac{1}{10}$ lb.) per plant. Estimates of the Guayule supply in large areas vary from 500 to 800 kilograms per hectare, but the distance between the different places where the plants are found is often considerable, and must be taken into consideration. The Guayule shrub is about two feet high, with knotted spreading branches and sparse, greyish leaves. The whole plant contains rubber, with the exception of shoots bearing leaves and flowers. Consequently the whole plant is gathered and the supply is rapidly exhausted on the area where gathering is done. Even the roots are in most cases pulled up by the collector, and the opportunity for re-growth is reduced to a minimum. The rate of growth is very slow, so that a plant 20 inches high is three to four years old, while plants five years old are not more than 30 inches high. Such a plant would weigh about four pounds. In view of these facts it seems more than illusionary to speak of growing the Guayule plant for commercial purposes. Brought under domestication the plant could naturally be made to grow much faster, but there are still other factors to be taken into consideration. The dry country in which the Guayule plant grows has a very scanty and irregular rainfall. For an agricultural crop that kind of land can hardly be expected to supply the necessary requirements, and the uncertainty about the germination of the seed brings in such an elementive chance, that indeed very much faith in Providence must be present to undertake the growing of Guayule without any pro vision for occasional artificial irrigation The price paid has been as high as $13 per ton of dry plants, pressed into bales, and delivered at railroad station. With that price, and the slow growth of the plant, it is difficult to see how any one can in earnest consider the cultivation of Guayule. Factories operating a large area should naturally take some steps for re-covering the ground with Guayule, but beyond sowing the seeds and taking the chance of their germinating and growing in a few years to a size that can be utilized, it is hardly possible to do anything. As for the fear of Guayule filling the market to the exclusion of crude rubber from previous sources of wild tropical rubber and from present and future plantations, such an idea is hardly worth refuting. If we remember that the requirements at present of the United States alone amount to more than. . . . . . 60,000,000 lbs. annually, a simple mathematical calculation, based on the most exaggerated expectations of the output of Guayule rubber from the entire territory where it is growing, will show the role this product could have in the world's market, even supposing that the supply was inexhaustible and as large as claimed by Guayule enthusiasts. It may be added that the quality of Guayule rubber is very inferior, the rubber being very sticky and rapidly deteroriating. The market value is very low in comparison with that of first-class rubbers, but it still leaves a wide margin for profit, and the supply of rubber plants is apparently enough for a few factories, not too closely situated. As a special product the Guayule has a market of its own, and if cultivation of this plant can be accompolished on a profitable basis, it will prove a great boon to the sterile parts of Northern Mexico. Another rubber plant of Mexico, *Euphorbia elastica*, has been spoken of. I have seen the plant, but have not been able to obtain a sample of the product, which I understand, however, somewhat resembles the Guayule rubber. In addition to this article, another communication on the same subject by Dr. R. Endlich appeared in *Der Tropenflanzer* (July, 1907, under the title "Uber den gegenwartigen Stand und die Aussichten der Guayule industrie) (on the present conditions and the prospects of the Guayule industry)": From it the following observations may be added to what has been said above. Dr. Endlich recognises a central area of 75,000 square Rm. (28,950 square miles) of Guayule land, comprising the northern parts of Zacatecas and San Luis Potosi, the eastern part of Durango and the south of Coahuila. Then there are smaller areas in Nueva Leon, Chihuahua, New Mexico, Arizon, and Texas. About one-tenth of

the central area may be said to be stocked with Guayule, yielding on the average half ton per hectare (½ ton per acre). The total supply of Guayule available is estimated at from 400,000 to 500,000 tons, but Mr. Hexly C. Pearson, the American expert of the "Indian Rubber World" (New York), allows only 300,000 tons. Investigations into the yield of rubber made by a competent chemist at Jimulco gave a result of 7-12 per cent. which agrees well with Pearson's figures of 6-11 per cent. Dr. Endlich, quoting from Pearson (in "El Financiero Mexicano," 15 de Averil de 1907) states that the export of Guayule rubber up to the end of January, 1907, was 6,100,000 lbs., of which 2,700,000 lbs. go to the second half of 1906 and 700,000 to January of the current year. The last prices quoted were 65 cents gold per lb. per New York, and 5·50—5·75 M. per Kg. per Hamburg. The extent to which Guayule land is restocked spontaneously is satisfactory, as there are plenty of seeds and the seeds germinate readily; but growth is slow, ten years being about the time required for a Guayule plant to become fit for a profitable working. By that time the stem should have a diameter of ¾ in. at the base. As to cultivating the plant Dr. Endlich is more hopeful now. Although the experiments made in that direction were on a small scale, he considers the fitness of the Guayule for plantation proved. Wherever soil and climate correspond to the physical conditions prevailing in the Mexican Guayule region, waste land may be profitably stocked with Guayule, particularly along with cattle-rearing as the primary industry. So far as soil is concerned the presence of a certain amount of lime seems to be essential, and as to climate it should be kept in mind that the occurrence of the Guayule shrub in the central area is limited to altitudes between 900 to 1,700 m. Sloping or undulating ground would answer best the situations of its natural habitats. Owing to the fact that Mariola (*Parthenium incanum*) has been mistaken for the Guayule (*P. argentatum*), it seems desirable to provide, if possible, against a repetition of the mistake. The following diagnostic comparison of the two plants, prepared by Dr. O. Stapf may, it is hoped, serve this purpose. Although the structure of the flowers and flowerheads of *Parthenium argentatum*, A Gray, and *P. incanum*, H. B. K., is very similar, there ought to be no difficulty in distinguishing the two plants, particularly when they grow, as is frequently the case, side by side. To facilitate comparison the more salient characters are set out here in parallel columns.

Parthenium Argentatum.	*Parthenium incanum.*
A small *shrub* with a short stem and very numerous, much divided branches, from less than 1 and over 3 ft. high; woody persistent branches short, more or less gnarled, covered with a rather smooth, dark grey bark; young shoots silvery grey all over.	A small *shrub*, 1–2 ft. high, much branched; woody persistent branches, elongate, slender, covered with a somewhat rough bark, cracking longitudinally; young shoots finely whitish or greyish wooly.
Leaves lanceolate, acute, entire or more often with 1–3 coarse acute teeth or lobes, 1–2 in. long, 2–6 in. wide, densely covered with a fine silvery grey tomentum, gradually narrowed into an often long and slender petiole.	*Leaves* obovate to obovate-oblong in outline, crenate (the smaller) to deeply pinnatilobed ½–1 in. long (rarely more), ⅓–¾ in. wide, lobes 1–2 in. on each side, entire or the terminal crenate, all very obtuse, the whole leaf densely covered with a white wooly tomentum when young, then greyish; petiole very short.
Flower heads subsessile, subglobose, 2-1 in. in diameter, 3-7 in a cluster; clusters at the ends of 2 or 3, rarely more, slender branches, collected into a very imperfect corymb, rarely solitary.	*Flower heads* peduncled, or subsessile, 2-1 in. in diameter, in terminal, often much branched corymbs, 1-4 in. in diameter, branches slender.
Involucre silky pubescent outer bracts broadly herbaceous on the back.	*Involucre* finely villous; outer bracts slightly herbaceous on the back above the middle.

Specimens of the Guayule plant (*P. argentatum*) and of Mariola (*P. incanum*) presented by the Foreign Office, also a sample of Guayule rubber, presented by the Compania Explotadora Coahuilense, are exhibited at Kew in Case 68, Museum No. 1.—*Royal Botanic Gardens, Kew, Bulletin, No. 7, 1907.*

A NEW RUBBER TREE: PALO AMARILLO.

(*Euphorbia fulva*, Stapf.; Syn. *E. elastica, Altamirano and Rose, not of Jumelle.*)

By Otto Stapf.

In July, 1905, Dr. Altamirano, Director of the Instituto Medico Nacional Mexico, and Dr. J. N. Rose, Assistant Curator of the National Museum, Washington, published a description and illustrations* of a new species of *Euphorbia* (*E. elastica*) known in Mexico as El Palo Amarillo. From the name, a footnote, and the description of the plates, it could be gathered that the plant was used and recommended for the production of rubber. A fuller memoir on the subject by Dr. Altamirano† appeared in the same year. An abstract of this was published by Dr. R. Endlich‡ of Mexico, and the notes given below on the tree and the rubber production from it are taken from this article. Unfortunately the name of *Euphorbia elastica* was, a few months previously, viz., in April of the same year, given by Professor Jumelle to a totally different species of *Euphorbia*, a native of Madagascar. The Mexican plant had therefore to receive a new name and, as "Amarillo" corresponds to the Latin "fulvus," I propose for it the name *Euphorbia fulva*. *Euphorbia fulva* is a tree 8-10 metres high, with a yellow, smooth, shining bark; hence the name Palo Amarillo,§ that is "yellow tree." It occurs in the States of Michoacan, Guanajuato, Jalisco, and in the western parts of the State of Mexico, usually at an altitude of 1500-1900 m. The annual rainfall of that area is between 550 and 750 mm., and the mean annual temperature between 17° and 20° C. (62·5°—68° F.). The tree thrives well also on stony or rocky soil. Attempts to produce rubber from its latex were made in Michoacan some time ago, but given up as no process was known to separate the rubber from the resin, which occur in the proportion of 18-20 per cent. and 40 per cent. respectively. Recently, however, Professer Lozano succeeded in separating completely the two substances and producing very good rubber, according to some, even better than "caucho negro" (Central American Rubber), and from the resin, an excellent varnish. The process of separation has, however, so far not been made public, and at the time the article was written the whole matter was in the experimental stage, although plans for working the Palo Amarillo in Michoacan were under consideration. Since then an application for a concession to establish and work factories for the extraction of rubber from the tree in the States of Guerrero, Jalisco, Michaocan, Guanajuato, Oaxaca, Puebla, Lower California, Colima, and the Territory of Tepic has been made by Senor Carlos Llaguna y del Hoyo, of Michaocan.* The latex of Palo Amarillo is yellowish white, thin, and does not coagulate readily. To effect this it is exposed to the sun. If not subjected to Lozano's process the product is dark yellow, dough-like and neither resilient nor viscous. If boiled the latex turns very sticky and whitish grey. Experimental tapping in Guanajuato and Michaocan resulted in an average yield of 1 lit. (1·75 pint) of latex per tree. It is recommended to proceed with the tapping from the branches downwards, and to use sharp tools. If the tapping is done judiciously the tree may be ready for another yield after three months, and it is expected that it will stand three tappings per annum for ten years.

In Atecucario hatches or "machets" (large knives) are used, and the incisions are made in an oblique direction parallel to each other, or in spirals. The latex is collected in petroleum cans or small pots. A certain portion coagulates on the tree and is removed with knives. It has been calculated that 100,000 trees would yield 300,000 Kg. (about 294 tons) latex per annum, from which 54,000—60,000 Kg. (53-58 tons) rubber and 120,000 Kg, (116 tons) resin might be obtained. The price of the rubber is estimated at 2 pesos (about 4s.), and that of the resin at 75 cms. (1s. 6d.) The scattered occurrence of the tree, however, and the great distance of the areas where the tree is fairly common are a considerable drawback. It has therefore been proposed to lay out plantations of the tree the more so as it is easily propagated by cuttings and grows fast. Large tracts of waste land might in this way be made productive. A valuable by-pro-

* Dr. F. Altamirano, El Palo Amarillo (*Euphorbia elastica*, Altamirano and Rose, sp. nov.) pp 1-3, tt. I-IV. (Secretaria de Fomento, Colonizacion e Industria Instituto Medico Nacional, Mexico, 1905).

† Dr. F. Altamirano, El Palo Amarillo como productor de caucho Primera memoria (Mexico: imprenta y fototipia de la Secretaria de Fomento, 1905). Not seen.

‡ Der Tropenflanzer, 1906, pp. 525–531.

§ The name Palo Amarillo is also applied to *Berberis pinnata*, Lag., (Mahonia pinnata, *Fedde*), and two species of *Boconnia*, viz., *B. arboria*, Watts, and *B. frutescens*, Linn.—See Ramirez, Sinon. Plant. Mex. p. 52.

* Diario Oficial, dated March 8th, 1907, according to an official despatch to the Foreign Office by R. Tower, Envoy Extraordinary and Minister Plenipotentiary, Mexico, dated March 12th, 1907.

duct of the Palo Amarillo is the oil (about 30 per cent.) extracted from the seeds. It is a good drying oil for varnish, and, like the oils of other *Euphorbiaceæ* a purgative. Considering the favourable nature of Dr. Altamirano's and Dr. Endlich's accounts, it may be useful to point out that Mr. George Kennedy, H.M. Vice Consul at Mexico, reports as late as February 28th, 1907, that no satisfactory process has yet been discovered to separate these two substances at a sufficiently low cost to give the Palo Amarillo a commercial value as a rubber producer. He also gives the proportion of rubber and resin (desiccated?) contained in the latex of *Euphorbia fulva* as 40 and 60 respectively.*

Finally, it may be added that *Euphorbia fulva* belongs to a small group (*Laurifoliæ*, Boiss.) of arborescent Euphorbias extending from Mexico to Peru and the West Indies. One of these species, *E. calyculata*, H.B.K., locally known as Chupire or Tencuante, in some parts of Mexico, occurs with *E. fulva*. Its latex is very inferior, and Dr. Altamirano suggests that the unsatisfactory results of the examination of certain samples of "Palo Amarillo" rubber may be due to a confusion of the two species. *E. fulva* can be easily distinguished from *E. calyculata* by its smaller leaves (3-6 cm.) by 1-2 cm.) which are woolly beneath, its short, stout, leafless flowering branches dividing into 4-5 rayed umbels, of which, however, only one ray is properly developed bearing a flower or fruit. The West Indian species is *E. punicea*, Sw., a native of Jamaica, Cuba, and the Bahamas. Nothing is known as to its economic value.—*Royal Botanic Gardens*, Kew Bulletin, No. 7, 1907.

* Report, enclosed in Mr. Tower's despatch, Commercial No. 13, of the 1st of March, 1907.

OILS AND FATS.

THE WAX PALM.

This palm belongs to the genus of Copernicia which consists of six species, all of which are natives of Tropical America. The species in question, also called Carnauba palm, has a trunk from 6-7 metres high, covered with leaf sears; with a circumference of 30-45 centimetres, the deeply divided palmate leaves form a spherical crown. The six to eight youngest leaves are characterised by being held together for a long time by a resin at the avil. The pinnaæ remain divided, but the leaves meet again at the top of the stem, forming a complete crown. The young leaves are on the underside of a light yellow; at this stage of their development they give off a dry, powdery, ash-coloured substance, which developes a peculiar but pleasant smell. This substance is a vegetable wax, it hangs so loosely that it can be shaken off while the leaves are young; but so soon as they have developed the circular form, a breath of wind suffices to scatter the wax. The small green flowers are inserted on much branded inflorescences at the avils of the leaves, they are followed by fruits, which are very bitter, but are nevertheless eaten by the Indians either raw or cooked. The dry parts of tropical Brazil form the region of distribution of the wax palms, they are most common in the province of Ceara to the dry climate of which they are particularly adapted. It does not rain there during six months, and it is just in that dry season that the wax palm puts forth its young leaves, and that the collection of the products takes place. A scanty rainfall during the wet season, and a succeding prolonged drought check the productive activity of the wax palm to such an extent that—as the experience in these last few decades has shown—total failure of the yield has often occurred. This tree can occasionally stand a prolonged flood up to several inches, above the ground line but a dry place, which is never subject to floods, is most favourable to its growth. It is so insensible to the heat that even a fire could not destroy its vitality.

By far the most important product of this palm is the wax which was discovered at the beginning of this century, but it was not exported until 1846 when Ceara exported 26,218 kilos; in 1860 the quantity had already reached 68,096 kilos. The port of Arcati exported in the same year 562,016 kilos. From this time these two ports exported on an average 100,000 kilos to the value of 750,000 marks. Pernambuco also takes part in the export, but with exceedingly fluctuating quantities. In the year 1875-76 were exported 18,668 kilos, value 15,150 marks, in 1867-77 171,980 kilos, value 139,140 marks, in 1878-79 1,542 kilos, value 1,220 marks. Nearly all these exports went to North America.

To estimate the yield of wax one must keep in mind that the greater part of it is used up in Brazil for candles, to which is added a little tallow. This branch of industry can be surveyed pretty accurately, because it is limited, with a few unimportant exceptions to Ceara. The extraction of the wax is only in this province carried on as an industry. According to official statistics the harvest in Ceara amounts in fertile years to two million kilos, half of which is made into candles at the place. These form an article for export to the neighbouring provinces, but the export would extend over a far larger area if technical progress were made in the manufacture of them. The candles are brought in spite of their deficiencies, as they are the cheapest material for lighting, and give out an odour for the sake of which they are burnt in churches. The wax is gained by a very simple process. When the leaves have passed into the stage of development they are cut down at the place where they spread in the shape of a fan; precaution must be observed that the youngest leaves in the centre of the crown remain unhurt, for they are to carry on the activity of the cut off leaves in the life of the palm, and they are to form the next yield.

The cutting is done by means of a sickle, which is tied to a long pole. An experienced labourer can cut down with this simple instrument a thousand leaves in a day. The vitality of the palm shows that, during the six dry months, it can be deprived of its leaves, if they have reached the above mentioned development, which, however, must not exceed this stage, as the wax falls off to the extent that it is scattered before the leaves reach the ground. The six wet months are quite sufficient for the recovery of the palm.

The cut off leaves are dried at the place, they are put in long rows on the ground, with the under side upwards, so that the wax does not come off. After four or five days they are put in a heap close to which a cloth has been spread. Leaf after leaf is beaten upon this cloth with a stick, until it is completely free of

wax, an occupation which generally is allotted to women. In order to loosen the wax the leaves are often split with a knife before being beaten. After a very small quantity of water has been added the wax is boiled in an iron saucepan, and in this liquid state it is put into earthenware moulds, in which it forms into a cake of about a kilo in weight.

The harvest extends as we have already mentioned over six months and is made twice a month. On an average eight leaves are each time cut off a full grown palm, making 96 during the season. On an average 850 leaves are necessary for the production of 16 kilos of wax; this may be gained from a fertile soil off 500 leaves from a poor ground off 1,200 leaves. I particularly mention this difference that it may be a hint when cultivaion is tried.

According to this a tree yields on an average 807-1000 kilos of wax, which is equivalent to the value of 1½ marks. This, however, is the gross cost, but as the palm has not been cultivated and the material has been collected from wild trees only the cost of working, which is small, has to be deducted to give the net cost.

On the basis of a total yield of two million kilos for the province of Ceara, it would be proved, according to the above mentioned calculation of an average yield, that 1,106,799 wax palms are in use. However, this is not nearly the number of the existing trees, not even in Ceara not to mention Brazil.

After the leaves have been beaten they are burnt for the greater part, an unjustifiable waste, for the leaves yield fibres, which the Indian use for the manufacture of excellent strings, cords, ropes, fishnets, mats, etc. The third part of all cordage used in the province of Ceara is said to be made from fibre of the wax palm. The prepartion of the fibre is exceedingly simple. The leaves are not subject to a process of steeping like any other fibre, but they are cut in strips and drawn over (combed) a board studded with nails or fish teeth.

These fibres are used in some parts of Brazil for the manufacture of articles which are made in Europe of straw, such as hats, baskets, brooms, etc. Another use is that as a stuffing for mattreses and cushions.

The dried leaves are used as a thatching for roofs of huts; it is light, waterproof and nice looking. It is said that in Ceara and the neighbouring provinces the third part of all the huts are covered with the leaves of the wax palm. The question whether the leaves are suitable for the manufacture of paper has been raised several times, but it has not been answered satisfactorily. To give an idea of the waste of a raw material, which may be used in many ways, of which the province of Ceara is guilty by burning the leaves of the wax palm, a Brazilian has made the following calculation. He puts as a basis an average yield of wax of 6,314 grammes per leaf, for the annual yield of 2 million kilos, and arrives at the result that 296,444,446 leaves must be cut off. As the harvested leaf weighs on an average 134 grammes, the total weight amounts to 39.723,555 kilos. Only a small fraction of this quantity is used, the greater part is burnt.

When the wax palm is cut down at a great age it furnishes an excellent wood for building and carpentering. It is very hard, of a yellowish red colour, traversed by black veins, and takes a good polish. It is much used for lathes and pumps. An objection to this wood is that it must not be exposed to the weather, as it rots in 10 to 15 years. It may be said to its advantage that it is not attacked by insects, and will stand sea water for an extraordinarily long time.

The roots of the wax palm are used as medicine in Northern Brazil. In the year 1870 an effort was made to introduce them into England as a cheap substitute for sarsaparilla, which naturally did not succeed. Its bitter oily seeds, of which it is said that they are used as food by the Indians, are sometimes roasted by the white inhabitants to serve either as a substitute for coffee or as food for cattle and fowls. Like all other palms this wax palm can be tapped, and syrup and arrack can be made from its juice. The pith is said to contain a very fine flour suitable for making moulds.

Until now very little has been done for the cultivation of the wax palm; some small plantations have been started in the province of Rio Janeiro, but no further attention has been paid to this cultivation. Plantations have been started in Ceara here and there along the road sides, but they are left entirely to themselves. As for the rest it is considered enough that a law has been passed, which punishes the cutting down of a wax palm, without the permission of the owner, with a fine of 2½ marks.

The wax palm of the Andes (*Croxylon Anticola*) which belongs to the small group of the mountain palm must not be mistaken for the wax palm. The trunk of the tree which grows to a height of 50 metres, which is found at a height of 2.500 to 3,000 metres, is covered with a crust, one part of which consists of wax, and three parts of resin; this gives it an

appearance of marble. In order to obtain the wax resin the tree has to be cut down and scraped. A labourer can cut down and scrape two trees in a day, and as each tree yields on an average 12½ kilos of each substance, he can gain 25 kilos a day which he can sell at a price of about 34 pfennig per kilo. The wax resin is likewise used for the manufacture of candles if it is mixed with tallow. This is not the only use of the palm. The wood of the straight high trunk is very durable, and it is used as a building material for houses, boats, water works, etc. The leaves can be used for the thatching of roofs, and the upper part of the trunk is covered with fibres, like those of the Gomuit and Pissavas palm.

It is surprising that the cultivation of the mountain palm has not yet been considered, as an otherwise useless soil can be made productive by means of them in contrast to the palms of the low land.

CARNAUBA WAX.

This substance, also known by the name of Ceara wax, which has been found in European commerce for several decades, comes from the Carnauba palm, a beautiful fanpalm, which, according to Martius, grows in the damp soils of the Brazilian provinces, Parnambuca, Rio Grande and Ceara.

The above named scientist says that the wax of this palm comes from young leaves. According to Senler, the young leaves are used for the obtaining of wax at that stage of development when they spread themselves out like a fan, showing a bright yellow colour on the under side. The Carnauba leaves which Wiesner saw at the Paris Exhibition (1867), and which were used for the manufacture of wax, were one metre in length.

Wiesner found that the wax covers the under as well as the upper side of the leaf, it appears to the naked eye as a perfectly even covering. The layer of wax is thicker on the upper side of the leaf. The wax comes off this side of the leaf in the shape of thin scales, 5 mm. long. The wax layer on the under side of the leaf is not only thinner, but it adheres so closely that it can only be obtained by scraping the leaves. The wax scales show very interesting structures, for instance, they show on the under side a very accurate impression of the marking of the epidermis. The scales reproduce very clearly the impression of the epidermis and of the stomata, especially of the latter, and they show distinctly that all the cells belonging to the epidermis take part in the excretion of the wax. The cells consist entirely of microscopic rods, sometimes cylindrical, sometimes prismatic in shape, lying at right angles to the leaf surface.

The extraction of the Carnauba wax is as follows :—The leaves are carefully cut off and dried in a situation where they can be laid on the ground in long rows with the under side upwards. After 4-5 days they are put in a heap and leaf for leaf is beaten with a stick until it is entirely free from wax. The wax comes off as a greyish white powder, which is either melted over an open fire or boiled with a little water in a pot. Another method is to dip the leaves directly into hot water and the excretion of wax on the upper surface is collected. The wax is put in this liquid condition into earthen moulds and left to settle into cakes of about 2 kilos. The raw carnauba wax obtained in this way formerly came in large quantities to England and other parts of Europe where it was refined by remelting. At present it is refined before exportation from Brazil, and forms a not unimportant article of commerce. In the year 1876 the yield was estimated more than 2,000,000 kilos, of which 1,500,000 kilos were exported to Europe.

The raw Carnauba wax is of a dirty yellowish green colour, brown in some parts and traversed by small bubbles. It appears opaque to the naked eye, except where the bubbles occur, but by means of a lens you can detect that it is covered with minute air bubbles all through. It forms into lumps or cakes which are of a darker colour on the outside, and they are covered with a whitish tinge which consists of a crystalline substance.

This kind of wax is hard, brittle, tasteless, it smells slightly of Cumarin when it is fresh, later on it is odourless. It shows much more clearly the confirmation of rods than the refined wax. In places it shows a fibrous tissue radially arranged. The irregular structure of the raw material can be seen much better under the polarising microscope than in the refined carnauba wax, and the prismatic colours stand out more clearly in many parts. Some parts of this kind of wax are of a dark brown. Remains especially of the epidermis are often found in it. The raw wax when heated melts down as a greenish brown substance and in which numerous brown globules float. These globules have, according to Wiesner, a granular structure of a dark brown colour, and melt at a much higher temperature than the wax ; they only dissolve with difficulty in alcohol.

The pure carnauba wax has a pale greenish yellow colour, a dense texture, is hard, brittle, tasteless and without smell. Air bubbles can only be seen through the microscope. Wiesner did not find any remains of tissue. When heated it forms a clear substance slightly aromatic.

The Sp. G.R. at 15° is (according to Storey-Maskelyne) 0·999. The melting point is variously given. According to Storey-Maskelyne this wax melts at 84° C., according to other observers at 93° C. Wiesner gives the melting point of the unrefined wax at 84·4° C., solidifying point at 80·9° C., of the refined wax melting point 83·6° C.

Solidifying point 81° C.

Saponification value 93·1. (Becker)

Acid value: 4 (Hubl.)

Ether value 75 (Hubl.)

Iodine value 13·5 (Lew Rowistch)

In cold alcohol carnauba wax is only slightly soluble, but it dissolves entirely in boiling alcohol and ether. Concentrated solutions solidify on cooling and deposit a white crystallisable substance that melts at 105° (Schaedler).

According to Lewy the refined wax contains 80·33 % of carbon, 13·7 % of hydrogen, and 6·60 % of oxygen. It consists chiefly of myricyl ether of cerotic acid, some cerotic ether and myricyl alcohol, which is extracted from the wax by means of cold alcohol. According to Sturke, carnauba wax contains besides these bodies :—

Carbohydrate, melting at 59° C.

Alcohol C. 26 H. 53 Ch. 2 O H

Double acid alcohol C H 2 O H C 23 H 46
C H 2 O H

an acid C 23 H 27, C O O H (the ismer of ligno cerin acid)
C H 2 O H

Acid of Oxy. C 19 H 38
C O O H as regards its laction.

According to Storey-Maskelyne the amount of ash of this wax is 0·14%. The unrefined wax examined by Wiesner gave 0·83, the refined wax only 0·51 % of ash. The ash examined by Maskelyne contained principally silicic acid, oxide of iron and salts. According to Brande the wax turns a reddish colour if it is boiled with potash for half an hour. It saponifies only partly with alcoholic potash. If 5 % Carnauba wax are mixed with stearic acid, cerine of paraffin, the melting point of the substance is considerably higher and the mixture is brighter and more solid. According to Lewy, Carnauba wax produces by dry distillation a kind of paraffin with a content of 85·24% carbon and 14·93% hydrogen.

The carnauba wax is used in Brazil for the manufacture of candles, in European industries for the preparation of varnish, as a substitute for bees wax, and also for brightening sole-leather (shoemaker's wax). According to Giutal a moderate amount of carnauba wax is an excellent raw material for the manufacture of sealing wax.

CITRONELLA OIL.

THE QUESTION OF A NEW TEST FOR THE PURITY OF EXPORTED OIL.

On representations made to Government with regard to adulteration of citronella oil, the question arose as to the advisability or otherwise of adopting a Government Standard Test in place of Schimmel's Test—the one universally recognised by the trade—so that the oil exported from the Island may not leave it without a guarantee of its purity.

Mr. M. Kelway Bamber, the Government Agricultural Chemist, was instructed to report on the subject. In a letter addressed to the Hon'ble the Colonial Secretary, dated the 21st November, 1906, he says :—

Sir,—With reference to our conversation and my visit to Galle *re* the adulteration of Citronella Oil, I have the honour to report as follows :—

1. At all the native stills visited, the oil was being distilled pure from the *lena batu pengiri* variety of grass. Samples collected at the beginning and end of the distillations differed considerably, the latter in no case passing Schimmel's test. A mixture of the whole distillate in one case barely passed the test and in others failed completely, although quite pure. The failure of this variety of oil to pass Schimmel's test has been pointed out in previous reports.

2. The adulteration with kerosene takes place chiefly at Matara and the neighbouring villages, tins of the oil being openly poured into the iron drums of citronella oil on their way to Galle.

3. I could get no direct evidence of other oils being used in the adulteration, though it is probable both *domba* and coconut oil are used to some extent.

4. Little of the better variety of grass (*Maha pengiri*) is apparently grown, as it is less hardy and has to be replanted more frequently. This is the variety grown in Java, the oil from which fetches a better price than the *lena batu* oil.

5. The question of the exportation of a pure Citronella oil and the adoption of a special test was discussed with the merchants of Galle engaged in the ex-

port, and none of them are in favour of Government interference or the adoption of any new test for the following reasons :—

(*a*) The purchasers have been used to, and know they are getting, an adulterated oil, and are quite satisfied with it.

(*b*) That soap-makers say the present oil answers their purpose, and it would not pay them to give more for a higher class oil.

(*c*) One firm, owing to their attempt to export a purer oil, by adopting a more rigid test of their own, lost the greater part of their oil business, which was over 50 per cent. of the total exports, and it was only when they relaxed their test and accepted less pure oils, that they were able to compete with the other firms; but they have not yet recovered their original amount of business.

(*d*) Most of the orders are received by cable from abroad to match a previous consignment, and they would not get a better price if they sent a purer article.

6. The chief difficulty in the matter lies in the fact that unless *every* firm agrees to refuse adulterated oils, those that do refuse lose business, while the other firms profit in getting the native custom, as the sellers naturally take it to where they know it will not be rejected.

7. Another difficulty is that there is little or no time to test an oil properly, as only a few hours are given for decision, or the sample is taken elsewhere; and as urgent orders have often to be filled, the merchant cannot afford to reject an oil and possibly let another firm get the business, especially when there is only a limited supply of oil available.

8. Messrs. Hayley & Co. would probably be willing to experiment with the exportation of a purer oil, if it could be demonstrated that a remunerative price could be obtained for it, but the demand must first come from the consumers, who must be prepared to accept a more rigid test of purity.

9. I discussed the possibility of erecting a refining still in Galle, but the opinion was that the residue would be too great to allow of its being profitably worked.

10. The actual distillers of the grass are usually not the owners of the land, but the stills are leased out for a proportion of the oil, which the land owners buy at the market rates.

11. There would be some temptation for the distillers to adulterate the oil to increase the output and their proportion, but apparently it is too expensive or troublesome to carry out the kerosene; though it might easily be carried in the returned drums.

12. One large grower was said to use spirit in addition to kerosene sufficient to enable it to pass the test; but this is easily detected.

13. I have made several further experiments as to a test that would meet all requirements, but with even pure oils distilled under apparently similar conditions the variation is such that it is a difficult matter. If the oils exported depended for their value on the proportion of Citronella only, it might be possible to fix a test by its estimation, but this could only be conducted by a trained chemist, and would take too long under the present conditions of buying and selling.

14. I have also tried several fresh experiments with the test previously suggested by myself, and can always obtain satisfactory results with samples of known adulteration even up to 70 % of kerosene and coconut oil; but others apparently are not so successful, probably owing to their not having a perfect standard to work from.

15. I would suggest :—

(1) That a reliable person be employed to visit a fair average number of the Citronella estates, of which I have a list, and purchase samples of the pure oil direct from the locked oil rooms, so that a fair average of the oil coming on to the market could be obtained for establishing a test.

(2) That samples of these pure oils be sent for valuation, and an opinion as to their scenting power compared with adulterated oils.

(3) That samples of the pure crude oils be redistilled and the residue estimated, and that the pure oils be sent for valuation in the same way, but to scent manufacturers as well as soap-makers.

(Sgd.) M. KELWAY BAMBER,
F.I.C., F.C.S, &c., &c.

Mr. Bamber, writing on 9th October, 1907, in continuation of his investigations, reported as follows to the Director, Royal Botanic Gardens :—

I sent Mr. Jowitt a large still of my own and different varieties of Citronella grass, so as to obtain absolutely pure samples for fixing a standard.

2. Mr. Jowitt wrote me yesterday that he now has several pure samples of oil from several varieties of the grass, but requires one more distillation to get sufficient oil of certain grasses for experimental purposes.

3. When in Java, after considerable trouble, I obtained about 300 cuttings of the true Java grass, which apparently differed somewhat from the Ceylon *maha pengiri* in method of growth. Most of these were sent to Peradeniya, but I found on enquiry only one plant had survived though most of the cuttings started to grow.

4. I also obtained the Singapore variety (apparently *maha pengiri*), and am trying to raise sufficient plants from these for an experimental distillation.

5. As I pointed out in my report of 21st November, 1906, and frequently before, Schimmel's test does not always give reliable results, and that *pure lena batu* oil as distilled in Ceylon frequently fails to pass the test. And any admixture of lemon grass oil makes it worse. A good well-distilled *maha pengiri* oil will pass the test, but even with this grass, if the distillation is too prolonged, it sometimes fails to pass, and careful experiments in this connection showed that while the first portion of the distillates with lower boiling point passed the test, the final distillate gave as bad a reaction as badly adulterated oil or pure lemon grass oil.

6. My own test is open to some objections, as it is essential that it is based on pure standards; it being necessary to use either a few cubic centimetres more of the 83 % alcohol, or a stronger alcohol, when testing *lena batu* oil than *maha pengiri* oil.

7. The practice of adding spirit to the oils also interferes with this as well as Schimmel's test, and involves a separate test, which could not well be done by the inspector.

8. I consider it essential that samples of the pure oil be sent, and reliable valuations obtained from importers, before anything can be profitably done at this end as regards fixing a test or standard, for the reason given in my report.

9. It might be advisable to bring the matter before the next Board meeting, and possibly some of the Galle merchants would attend and give their views on the matter.

(Sgd.) M. Kelway Bamber.

Writing on the 24th December, 1907, to the Secretary, Agricultural Society, he further reported :—

With reference to our recent conversation, I have again gone through the papers connected with the Citronella Oil Test, and would add the following remarks to my previous reports:—

a. The pure oils distilled by Mr. Jowitt showed that even *lena batu* oil grown up-country, when carefully distilled, passes Schimmel's test. Some of the *mana* grass oils also passed the test indicating that much depends on the method of distillation and the kind of still employed.

b. The cost of improved stills that would compete with those employed in Java is prohibitive to the native distiller of Ceylon.

c. The question of the possibility of erecting a Central Still in Galle for re-distilling the oils as suggested in my report has not been further gone into, and is worth consideration.

d. An alternative would be to have better stills in various centres to which all the grass could be carried on the principle of Creameries employed in large milking centres. This would entirely prevent the possibility of adulteration, and would probably be better than having a re-distilling plant in Galle.

e. It is evident from Mr. Hayley's letter of the 29th November, that the firms interested in the industry are still very averse to any other test being applied as indicated in my report to Government dated 21st November, 1906.

f. With regard to paras. 5 (*a*) and (*b*) and the suggestions in para 15 of the same report, I am proceeding to England and the Continent, and will endeavour to ascertain the views of importers as to the question of a purer oil, and communicate with the Board.

I am still strongly of opinion that some method of preventing adulteration is advisable to re-establish the good name of Ceylon Citronella oil; but it is first necessary to ascertain the opinions of importers whether a purer oil is likely to be successful from a commercial point of view; and, secondly, to adopt better methods of distillation so that the product may be of the finest quality.

(Sgd.) M. Kelway Bamber.

In the meantime it was deemed advisable to ascertain the views of the chief exporters, and in response to a Circular the following letter was received from Mr. Chas. P. Hayley :—

Galle, 29th November, 1907.

The Secy., Ceylon Agricultural Society.

Sir,—In reply to your letter of 15th instant, I have the honour to inform you that I laid it before the Galle Chamber of Commerce at a meeting attended by all the European firms interested in Citronella.

It was unanimously agreed that the test now made use of is sufficient for all practical purposes—no new method is required.

It was adopted after many years of experiment, and experience has shewn what it indicates with little difficulty when oil is pure and when impure fixing the degree of adulteration sufficiently for all Commercial purposes.

It is the test commonly used by consumers in Europe and elsewhere, and for this reason it is unwise to introduce a new one which they would probably refuse to accept.

It is probable that an Analytical Chemist can suggest a method by which, in his laboratory, with the aid of his appliances he can point out adulteration to a minute degree, but it would be unsuitable to buyers and sellers alike when the value of half a ton or more has to be ascertained in a few minutes.

The question of adulteration can easily be solved by consumers, if they wish to obtain a pure article ; all they have to do is to offer a higher price for it than for one that is not so, or to refuse impure oil ; they state, however, that any restrictions placed upon its export would increase the cost so much that they prefer to purchase it slightly adulterated.

Recently some European buyers have increased the severity of their test, and with cheaper prices now ruling, it is probable that all will insist upon an improvement in quality.

High prices check consumption and react upon the market to the serious loss of the producer. In April this year the price of Citronella rose to 22¼d. per lb., it has now fallen to 12½d.

I am, Sir,
Your Obedient Servant,
CHAS. P. HAYLEY.

The question which was referred to the Board of Agriculture by Government for an expression of opinion formed one of the subjects that came up at the meeting held on the 3rd February, when after discussion it was unanimously agreed that there was no necessity for a new test.

EDIBLE PRODUCTS.

THE VANILLA CROP SINCE 1901.

According to a calculation of Mr. Maurice Simon, of Paris, the following table represents in Kilogrammes the Vanilla harvests of recent years in the principal countries of its production :—

	1901-02.	1902-03.	1903-04.	1904-05.	1905-06.	1906-07.	1907-08. (Estimated.)
Bourbon ...	110,000	100,000	90,000	55,000	50,000	30,000	50,000
Seychelles ...	72,000	52,000	65,000	50,000	45,000	20,000	50,000
Komoros Mayotte	40,000	70,000	55,000	95,000	125,000	105,000	85,000
Madagascar, Nossi-Be	—	—	—	20,000	30,000	40,000	60,000
Mauritius ...	2,500	2,000	2,000	2,000	2,000	3,000	2,000
Antilles	5,000	10,000	6,000	3,000	2,000	5,000	10,000
Ceylon, Java ...	1,500	4,000	3,000	3,000	2,000	3,000	4,000
Fiji Islands and Congo... ...	2,000	1,500	2,000	1,300	1,000	1,000	3,000
Total ...	233,000	239,500	223,000	229,300	257,000	207,000	264,000
Mexico	30,000	38,000	35,000	130,000	75,000	120,000	200,000

In the above table no account is taken of the crop in various countries which have only recently begun to produce Vanilla, such as Zanzibar, German East Africa, the New Hebrides, etc.—*Tropenpflanzer.*

TEA IN JAMAICA.

BY THE HON. H. E. COX, JAMAICA.

In bringing before you the subject of tea culture in this island, I will deal firstly with its history; secondly, the conditions under which it has taken place; thirdly, the mode of culture followed; and lastly, the preparation of the leaf for use. Tea is essentially a factory crop; by over-production in the past the market prices have been forced down to such a low level that only by the use of the best machinery, and the utmost economy in management (for which a large area under cultivation is necessary), can the cost of production be recovered. But it is a safe crop for a settler who lives within range of an existing factory, for he can always have there a steady market for the leaf grown on his holding.

HISTORY OF TEA CULTURE AT JAMAICA.

The pedigree of the tea plant is a long one. The origin of its use as a beverage is lost in the mists of Chinese antiquity. Until the year 1833, it was not known to exist outside China, but in that year a variety, far more robust than the Chinese kind, was discovered in Assam, and became the parent of the Indian, and later of the Ceylon teas.

In Jamaica, the history of the tea plant dates only from 1868. Indian and Chinese varieties were then imported for the Government Gardens at Cinchona. In 1887, a cultivation of a few acres was made on the Blue Mountains, but was not continued, and no further attempt was made to grow it on a commercial scale until the cultivation was commenced at The Ramble in St. Ann. At first this experiment proceeded very slowly. The red soil of St. Ann is very different from the black soil of the Blue Mountains; the elevation of The Ramble above sea-level is only 1,600 feet, while that of the Gardens at Cinchona is 4,500 feet, and the rainfall in St. Ann is considerably less. It was therefore necessary to proceed cautiously. The experiment was commenced with 250 plants and a packet of seed from Cinchona. After a year's trial it was found that these grew freely; other plants and seeds were then obtained from the same source to extend the cultivation, but the supply being necessarily limited, the increase of acreage was small. For some years no attempt was made to manufacture tea from the first few acres planted; the trees were left to grow on, to flower and bear seed for further planting. This reserved seed garden is now giving a steady supply, so that planting can go on more rapidly. It may be asked why seed was not imported. No seed could be had from Ceylon, as there is a prohibition in this colony against any importation of seeds or plants from that island, so as to safeguard the country against any introduction of the coffee leaf disease. From Assam, seed might have been obtained, but two reasons made it undesirable. Firstly, there was danger that some of the enemies of the tea plant which are found there might be introduced with the seed; and secondly, any change of soil and climate affects

the character of the tea produced. The Cinchona strain was commenced with, and it was thought better to keep to that alone. The next step was to find out whether the leaf would make good tea. For this purpose a small quantity of the leaf was plucked, rolled by hand and dried in the sunshine. This proved to be of very good quality, and all the initial difficulties were disposed of, the requisite machinery was imported, and the tea placed on the market in the latter part of 1903. The manufactured tea has a mild character similar to the old China teas, and the absence of astringency is a marked feature. At the beginning of 1906, about 100 acres were under cultivation (only a part being available for crop), and since then 50 acres more have been planted with seed.

CONDITIONS UNDER WHICH CULTURE HAS TAKEN PLACE.

The Ramble is on the north side of the island, 13 miles from St. Ann Bay. It consists almost entirely of hills with a basis of white limestone, which provides complete natural drainage. The tops of the hill where the rock crops out are thickly covered with trees, while on the lower slopes lies a deep red soil. At the edge of the rocky parts the limestone is in many places decomposed into what is locally called gravel. It is only in the red soil that the tea plant looks healthy; seed planted on gravel will germinate, but the leaves are yellow and sickly, and the plant will die out. There are no streams, and for practical purposes no springs in the neighbourhood; the rainfall therefore is of primary importance. From Table I. it will be seen that during the nine years, 1898 to 1906 the highest rainfall in the twelve months was 96·36 inches, the lowest 71·79 inches, and the average 82·80 inches. The greatest number of days in a year on which no rain fell was 194, the least number 145, and the average 163. The number of days with rainfall of ·01 to ·04 inches was—the greatest 70, the least 40, and the average 56. The number of days with a rainfall of ·05 to ·49 inches was—the greatest 111, the least 70, and the average 94. The number of days with rainfall of ·50 to less than 1 inch was—the greatest 33, the least 21, and the average 28. The number of days with rainfall 1 inch to under 2 inches was—the greatest 20, the least 13, and the average 17. The number of days with rainfall of 2 inches or over was—the greatest 10, the least 4, and the average $6\frac{2}{3}$. It is therefore seen that, on the average, about 200 days in each year have some rain, and about 145 days have more than 5 points. The longest period in any year which had no rain of 5 points or over was 26 days, the shortest 8 days, and the average 16 days. The dry time occurs in March and April. This even distribution of the rainfall is of the utmost importance, for the crop depends on a constant growth of young leaves (called flushes) being thrown out, and it is evident that frequent gentle rains, with intervals of bright sunshine, will produce the best results. The average temperature of the year varies between 80·06° and 77·25° for the maximum, and 66·88° and 63·23° for the minimum. The day maximum has been above 90° only five times during the nine years (all these being in the years 1903 and 1904), and eight below 65°. The night minimum has not gone above 73°, and once fell to 50°.

Table I.—SUMMARY OF RAINFALL FROM 1898 TO 1906.

Year.	Annual Rainfall.	Number of days with: No rain.	Under ·05.	·05 to under ·50.	·50 to under 1 in.	1 in. to under 2 in.	2 in. to under 3 in.	3 in. or over.	Not marked.	Total.
1898	76·85	175	45	93	32	16	2	2	—	365
1899	90·56	194	44	70	28	20	5	4	—	365
1900	78·02	145	60	111	28	15	5	1	—	365
1901	86·99	150	70	85	33	19	6	2	—	365
1902	75·74	165	64	91	23	18	2	2	—	365
1903	71·79	157	69	90	29	13	2	3	2	365
1904	96·36	155	49	111	21	20	7	3	—	365
1905	77·35	176	40	98	29	13	4	3	2	365
1906	91·57	148	64	98	29	19	3	4	—	365
Average	82·80	163	56	94	28	17	6	$\frac{2}{3}$		

Table II.—AVERAGE TEMPERATURE FOR THE YEARS 1898 TO 1906.

	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
Maximum	79·02	79·46	79·51	80·06	79·05	78·72	79·67	77·25	77·54
Minimum	66·55	66·74	66·88	62·25	64·29	63·23	64·59	64·48	64·04

THE MODE OF CULTURE.

The ground taken for planting has been common grass pastures. Three methods of preparing the ground or planting have been tried: (1) ploughing and cross ploughing, (2) forming trenches 1 foot wide and 18 inches deep, and (3) digging holes where the plants are to stand, about 15 inches cube. It is not possible, at present, to express an opinion regarding the comparative merits of these methods; in all the earlier cultivation the land was prepared by ploughing, and the last two methods have not been tried sufficiently long to judge results. The plants were, at first, put in 6×6 feet apart, but it was soon found that this gave too much room for weeds. A plant was then put in each interval in one direction, making the spaces 6 feet by 3 feet. In the later plantings, the distance has been still further reduced, the holes being placed 4 feet by 2 feet. It is, I believe, in India the custom to plant closely so as to cover the ground quickly, but I do not purpose to reduce the interval between the rows below 4 feet, because that width is necessary to allow of cultivation and to let in light and air between the plants. Propagation is by seed; cuttings occasionally strike, but not sufficiently well to be useful. Planting the seed at stake appears to be preferable to forming seed-beds and transplanting. In the latter case a spell of dry weather and hot sunshine after transplanting may cause the loss of many plants. The seed may be germinated before being planted, but great care is then needed in planting it, as the young shoots are very fragile; if not previously germinated, the plant should appear in from one or two months after sowing. When the plants have grown a few inches high, the ground is gone over and any gap supplied. In spite of this supplying, there appear gaps later on, which are filled with plants from seed-beds of about the same age as the rest of the field. The cultivation for the next three or four years is simply to keep the ground between the plants as clean as possible. This entails a constant expenditure in destroying weeds one month to see them grown again in the next month. This long period of expenditure without income, combined with the considerable outlay for buildings and machinery, is the great drawback in the industry. After about four years, when the plants may be about 4 feet high, they are cut down to a uniform height of about 9 inches. Of course all the leaves come off with the prunings, and the field becomes a scene of withered twigs and bare stumps. In six weeks these stumps will have thrown out a quantity of fresh young shoots, which are allowed to grow to a height of about 6 inches and are then tipped, *i.e.*, the end is broken off. After a further wait of about a month, the fresh growth is plucked for crop. It is usually found that the first pluckings do not make such good tea as the later ones. From this point the crop depends upon the weather. If there be mixed rain and warm sunshine, with moisture in the air, the trees should give a crop of leaves at about two weeks' interval for some months, gradually giving less as the time returns for pruning, which consists of cutting all the leaves down, and removing all knotty and badly grown wood. In the second cutting the plants are left 13 or 14 inches above ground, and in each succeeding year the height is increased about 2 inches. In India it is expected that each acre should give at least 1,000 lbs. of green leaf in a season; but, as the yield must vary with the space allowed to each plant, the age of the plants, and to some extent also with the weather, it is impossible to make really reliable comparisions as to the yields per acre.

THE PREPARATION OF THE LEAF.

After plucking, there are four processes through which the leaf has to pass: first, withering; second, rolling; third, fermenting; and fourth, drying. In the old Chinese culture all was accomplished by hand labour, but in Jamaica it would be impossible to compete for commercial purposes without machinery. The plucking of the leaves requires care; only the soft young growth at the end of the shoots must be taken, consisting of the bud with two, two and a half, or three leaves, according as whether the plucking is to be fine or coarse. The axils of the leaves below the part plucked must not be injured, and to break off the whole shoot at the joint (as is sometimes done) must be treated as a serious offence. The freshly plucked leaves have to be spread out as much as possible apart from each other to wither. For this purpose much space is required, as a single pound weight of leaf will need

about a square yard. The best material on which to spread the leaf is wood. The time needed to wither the leaf is usually about fifteen to twenty hours, but the relative humidity of the atmosphere naturally affects it materially. When successfully withered the leaf should feel like thin, soft kid leather, the leaf is then put into the roller. In hand making, a ball of leaves is taken in the two hands, and worked round and round on a table; the action of the machine is to imitate this movement. In some machines the box containing the leat rotates on a fixed table, in others the leaf holder is fixed and the table rotates; in either case the leaf is kept in a constant twisting move ment by raised ridges. This process gives the twisted look so familiar in dried tea, and prepares the leaf for fermentation by partially crushing the cells, and making their contents accessible. The rolled leaf is passed through a rotating wire mesh cylinder to separate the large from the small leaves (as the large require more fermenting than the small), and each size is spread out thinly on cement-covered tables, and covered with a wet cloth. The leaf when put into the roller was bright green; on leaving the roller it has become yellowish. As fermentation proceeds, the colour changes to bronze, and the scent of the leaf changes also. It is during this process that the substances which give flavour to the tea are formed, and good judgment is required by sight and smell to determine the time when the maximum of flavouring matter has been produced, for if left too long the substances giving the flavour are again decomposed, and the tea becomes flat and tasteless. When judged to be ready the leaf is carried to the drier, and subjected to strong heat (say, about 230° F.), which at once stops further fermentation and fixes the products. The tea is spread on wire mesh trays in the drier, the action of which is to pass hot dry air through these trays, and thus carry off the moisture from the tea. The air is heated by passing through flues or tubes arranged in or around a furnace. There are several forms of drier. In some, the hot air passes upward from below; in others it is forced downward through the trays by a fan; and in others the leaf is carried through on by moving trays. The leaf being wet when first put into the drier is not scorched by the high temperature, but after a short time it is advisable to move it into another drier at a low temperature, say, 180° to 200° F. When thoroughly dry, the tea is stored in large boxes until required for packing; a large quantity is then fed into a rotating cylinder with varying sizes of wire mesh, which sorts the dry leaf according to size, the smaller leaves being the finest. It has been the custom to call the various sizes by fancy Chinese names—Pekoe, Souchong, etc.—which are useless for purposes of classification, there being no standard by which to fix the terms. The tea is then packed, either in lead-lined chests, in tins, or in lead packets, and is ready for market.—*West Indian Bulletin.* Vol. III, No. 3, 1907.

CACAO INDUSTRY OF ST. THOME.

The cacao industry of St. Thomé has of late years developed so rapidly that this small island is now one of the most valuable of the Portuguese possessions. Referring to the production of cacao in St. Thomé, the United States Consul at the Madeira Islands writes in his recent Report:—

The cacao crop of the whole world is estimated to be 2,300,000 bags of 130 lb each, and of this amount the small island of St. Thomé, with only an approximate area of 355 square miles—not more than one-third of which is in actual cultivation—supplies 450,000 bags, or about one-fifth of the total, a harvest worth to them over $8,000,000 annually. Statistics show the growing importance of this island as a producing centre. The crop of 1897 was 141,663 bags of 130 lb. each; in 1900,—220,149 bags; in 1905,—425,196 bags; and in 1906,—407,452 bags.

The trees begin to bear after five or six years, but they do not attain maturity of productiveness until they are ten years old, after which they continue to give their fruit for about forty years. If one considers these initial difficulties, it seems remarkable that St. Thomé has been able to more than double her output of cacao in so short a period, and looking into the future (assuming the maintenance of present prices), it may not be an exaggeration to say that the present production will be again redoubled in the next ten years, since there is much more land available there for the cultivation of the cacao tree than is now in actual plantation; and there is, as might be expected, great activity in soil clearing and crop extension.

A casual study of the cacao markets of the world would seem to further justify this prophecy. The present demand for cacao can scarcely be satisfied, and, according to late returns from London, buyers are taking deliveries more freely than ever before. This is not from the fact there is any special shortage of supply, but simply because there is such an eager competition to secure orders for delivery that prices are

keeping higher than conditions really justify. There seems no doubt, from this and other indications that, if there was a large supply, there would be a correspondingly larger consumption. The total available deposits of cacao to cover the demand during the non-productive months decrease annually, seeming to present a growing excess of consumption over the visible production.—*Agricultural News*, Vol. VI, No. 147, December, 1907.

WEST INDIAN BROOM CORN.

Reporting on a trial shipment of broom corn sent from Antigua, Messrs. T. S. Simms & Co., Ltd., St. John, New Brunswick, write as follows to the Hon. Francis Watts, C.M.G.:—

The shipment of broom corn has come to hand. We find that it compares favourably with the corn we are getting from Oklahoma, although it is not quite equal to that raised in Illinois. If anything, the fibre is a little finer and the colour is better than that of the Oklahoma corn.

The particular objection we have, however, is in regard to the length. The bales sent contained straw a good deal too long for use in our largest brooms, which necessitates cutting and wasting the heavier part. We are having the same trouble with Oklahoma corn, and we think perhaps that, if it were sown a little more thickly, this would prevent the straw growing to such length. On the whole we can use this corn to good advantage. but it would be more profitable, both to the grower and to ourselves, to have it shorter.

We usually buy in bales of 250 to 300 lb. each, bound with wire bands. If you made a business of raising the corn, the bales shipped should be more tightly pressed together in order to save space and so reduce freight.

We are allowing the same price for this small shipment as Oklahoma corn, delivered here, costs us.

If this corn can be raised with you as cheaply as in the Western States, we think it should be a profitable crop, and you would have some advantage by way of freight, as much of the broom corn we buy comes entirely by rail from Oklahoma.

We are using about 300 tons of broom corn every year, and, should you wish us to do so, we could probably dispose of a much larger quantity if you can raise it so as to compete with the United States product.

We shall be glad to hear from you again as to the prospects of your continuing to raise this crop, and what quality you would be likely to have.

In this connection, too, Mr. W. Robson, Curator of the Botanic Station, Montserrat, reports that a small shipment of broom corn (250 lbs.) was, in May last, sent to Canada from Montserrat by the Hon. W. H. Wilkin. This was disposed of by Mr. J. Russell Murray, and realized a price of 4½c. per lb., or $11·25 for the bale.

From experiments that have been carried on at the Botanic Gardens, Mr. Robson is led to believe that a return of 600 lbs. of brush per acre is about the yield that may be expected with the broom corn crop.—*Agricultural News*, November, 1907, p. 373.

[This crop is rarely cultivated in Ceylon, but might prove valuable in the North.—ED.]

JAVA'S SUCCESS IN CANE SUGAR.

The extraordinary development of the cane sugar industry in Java has been a surprise to the sugar world. When the Hawaiian reciprocity treaty was first negociated some thirty-two years ago, it was said that the total product of Hawaii could probably never exceed, even if reach, 100,000 tons. During this generation, however, the production of Hawaii has reached up to about 400,000 tons. Cuba reached a production of about a million tons before the Spanish war. During that war the production fell to almost nothing, and its rapid recovery under the Cuban Republic and American influence has been extraordinary, but hardly yet even exceeds, relatively, the development of the Java sugar industry.

In Java in 1896 the crop was about a half million tons, and rose constantly until during recent years it seems to have struck its own natural equilibrium, at about a million tons. The exact figures are given as follows for the eleven years, 1896 to 1906 inclusive :

Year.	Production in tons.
1896	534,390
1897	586,299
1898	725,030
1899	762,447
1900	744,257
1901	803,735
1902	897,130
1903	931,296
1904	1,055,013
1905	1,039,178
1906	1,048,275

The area planted in sugar cane in Java reaches about 283,000 acres. There has been a slight increase during the last two or three years, but no increase of any great moment, all of which indicate that the present production of sugar in Java of about a million tons, is about the limit of its successful production under the competitive conditions environing that colony. It is a fact that the Javanese had the example of the Hawaiians in modern came sugar manufacture, and they have worked up to it most admirably. It is stated now that the production of cane sugar per acre in Java is about double the average beet sugar production per acre in Germany. Our readers are doubtless familiar with the fact that, under the control of the Dutch Government, the sugar lands of Java are retained, so far as their title is concerned, either in the Dutch Government, or in the native landholders, and much of the land bears but one cane crop, and the following year goes into rice culture, which is the mainstay in the way of food supply of the native Javanese. To whatever extent this is done, and as we understand it the greater part of the land is thus cultivated, the Dutch sugar planters in Java lose the advantage of ratooning. On the other hand, they get larger crops by having constant plant cane crops, and by shifting the land annually they get some advantage in the way of greater fertility, and the cost of labour is probably as low, or lower there than anywhere else in the cane sugar-producing world.

The yield in sugar in Java on the weight of the cane during the last ten years has averaged about $10\frac{1}{2}$ per cent of the weight of the cane, or about 210 pounds per short ton. This is considerably below the yield of sugar from beets, which in Germany in the season of 1905-06 was 15·28 per cent, that of Austria-Hungary 15·27 per cent; that of France 13·19 per cent; that of Holland 14·47 per cent; and that of Sweden 15·02 per cent. Cuba is reported to have realized in sugar slightly under 10 per cent. of the weight of the cane.—*The Louisiana Planter and Sugar Manufacturer.* Nov. 2, 1907,

YIELD OF CACAO IN TRINIDAD.

A brief paper on the yield of cacao in Trinidad has been prepared by the Hon. Carl De Verteuil for the purpose of discussion at the Conference :—

It has often been stated that the yield per acre of cacao in Trinidad compares somewhat unfavouably with the yield of other cacao-producing countries. The object of this paper is to bring forward the few reliable details with reference to this subject.

In Trinidad, estates are bought and sold on the number of trees. The value of a property depends on the number of full-bearing trees. The area is rarely, if ever, taken into account, and the yield of cacao per tree or per acre is never considered.

Distances at which cacao trees are planted vary from 10 to 16 feet. Twelve feet may be taken as the average, although there is now a tendency to plant at distances of 14 feet, for experience has shown that in good cacao land the yield per tree is better when the plants are farther apart.

The yield of 10 bags per 1,000 trees on a well-cultivated estate is considered to be poor, whereas 13 to 15 bags per 1,000 trees are considered to be a fair yield, and several properties have been known to yield from 20 to 22 bags. (A bag of cacao is taken to be $1\frac{1}{4}$ cwt.)

Ten bags to the 1,000 trees mean but a yield of about $2\frac{1}{2}$ to 3 bags to the acre, varying with the distances at which the trees are planted apart. In 1906, a Committee was appointed by His Excellency the Governor to inquire into the labour conditions at Trinidad, and in their exhaustive report it is stated (Clause 50) that the acreage under cacao is unknown. In Clause 62, attention is drawn to the practically entire absence of statistics relating to agriculture.

In the Blue-book of 1904-5, the acreage under cacao is given as 190,000 acres.

The acreage alienated in the seven years 1898-1904, practically the whole of which was for cacao cultivation, is stated to have been 91,251 acres. As it takes from eight to ten years, at the very least, to bring land from forest into full-bearing cacao cultivation, it is quite clear that the total acreage given above cannot be taken into account when computing the yield of cacao per acre. From personal observation, it may be stated that a very large acreage of land alienated from the Crown twenty years ago is still uncultiavted.

The Labour Committee (Appendix U) estimate the acreage in bearing cacao at 77,000 acres, and the export for 1904-5 (a good year), and 1905-6 (a very poor year), is calculated at 271,260 bags and 226,237 bags respectively. Assuming that the figures arrived at by the Labour Committee after a careful inquiry are correct, it will thus be seen that the average yield per acre for these two years is equal to $3\frac{1}{4}$ bags per acre. This, I think, compares favourably with the yield of every cacao-producing country, when it is taken into consideration that a large quantity of the cacao is planted in unsuitable soil, and that very small

attention is given to careful cultivation by a large number of proprietors.

It should be mentioned that the figures given above as to the exports of cacao have been reckoned in both cases from September of one year to October of the next, for this period covers the whole crop, and does not, as in the case of those obtainable from the Blue-book for the financial years, involve the accumulation of half of the crop of one year and half of the crop of the next.—*West Indian Bulletin: The Journal of the Imperial Agricultural Department for the West Indies*, Vol. VIII, No. 2.

CACAO: ITS GENERAL CULTURE.

By Mr. O. W. Barrett, delivered 12th November, 1907.

[Revised from the Report of "The Mirror."]

Your Excellency and Gentlemen:—Let us do some sifting. The opinions and practices, right and wrong, regarding cacao culture, must be multifarious,—not to say too numerous.

We may divide the planters here into three classes: those who are satisfied to brush, prune, and reap the current crop; those (the great middle class) who intend to increase their yields when they get the necessary time and money; and those who are discontented with the present status and who are actually striving to remedy some of the old mistakes. The percentage of intelligent planters who *grow* cacao in Trinidad and Tobago is undoubtedly high; but nearly every one of the two or three scores of proprietors I have met here are "land poor," so to speak—they instinctively try to get all the neighbouring contracts before their neighbour does, even when they know they cannot properly work those new fields without augmenting their labour and superintendence item. They have no time to study their crop. In fact, it appeares that some (few, I hope) planters shrink from doing anything which would increase their crop because then, with the plantation deplorably undermanned, as almost all in Trinidad are, it simply could not be handled. They have no time for anything whatever beyond the *regular* brushing and picking. They do not believe in the "Little field well tilled" policy.

The cacao tree has a surprisingly large amount of inherent vitality, but, unfortunately, it has a thick bark which furnishes an ideal field for the growth of bacteria and fungi. Cut, starved covered with hundreds of half-healed sores, it struggles through an existence of one or two scores of years; but break a root, or cut a cushion, or bruise a branch and the wounded area is at the mercy of the ubiquitous myriads of germs which cause in nearly every case more or less loss of tissue. I wish every planter would just sit down and figure out the thousands of dollars he has stolen from himself through the time-honoured methods of killing cushions, of making holes in the trunk, and of the strangulation of sap currents by the partial ringing of the stem. The aforementioned first kind of cacao planter will of course never blame himself for losses which he cannot plainly see; when trees die, pods turn black and brown, and there's nothing to pay for improvements with, he can easily show you that the weather or wind was unpropitious, or fall back proudly upon those dear old moon beliefs.

However, gentlemen, there is a growing class of cacao producers who have finished with most of the malpractices of culture inherited from—others. With the encouragement and assistance of this Society, and, I hope, also of the Trinidad Government, there will soon be but a very small proportion of the planters who remain in ignorance as to right methods. I have discovered a few books on scientific agriculture about the Island. Instead of the present average annual yield of 1¾ or 2 pounds per tree no conscientious planter will be satisfied with less than 5 pounds. I have heard of several cases of single trees producing about 300 pods at one picking: that is, about 20 pounds of dry beans. 100 bags per 1,000 trees per picking is therefore not impossible, yow will please remember. If you will pardon the repetition of a few points, I would like to make the following recommendations concerning general sanitary measures to be adopted on the average cacao estate.

Direct sanitation embraces the stimulation of the plant by the application of plant foods, and the prevention of infection by diseases through spraying and the dressing of wounds. Indirect sanitation includes protection from wind; forking of the soil; covering the soil with either a live or a dead mulch; draining; removal of weeds, moss, etc.; and in the *present* stage of the cultivation here, removal of the overplus of shade. I regret that in touching briefly upon these matters I must openly disavow some of the recommendations of the Botanical Department, especially those made by one of its Agricultural Instructors, some of whose advice, let us hope, is more a freak of professional jealousy than of ignorance. First then,

nearly every cacao tree in this island is in need of more food; many are actually starving. Unless the soil surface is loosened either by mulching or by the vertical forking operation, most of the nutriment contained in the decaying leaves, branches, etc., lying on the ground is washed away by rains into the drains. Very few planters have treated their shell heaps economically; instead of throwing the broken pods into a ravine, burying them in pits, or scattering them raw over the ground, they should be either composted in concrete pits or shovelled into a pile, well limed and covered with banana leaves. This causes a rapid fermentation and soon reduces the heap to a manure pile which should be spread lightly over the surrounding area as soon as the crustiness has disappeared. The lime and the scavenger bacteria covered in by the leaves will rapidly destroy the spores in and upon the shells, thus reducing the possibility of contagion to the minimum. A medium sized shell heap treated thus should be worth $2·00 to $5·00 as manure. Artificial fertilizers should be tried conscientiously—not upon a few trees on uneven ground having a "packed" surface. Remember that two light applications are four times as good as one heavy one. I would recommend the potash and phosphoric acid mixtures; nitrogen should be put into the soil by leguminous cover crops like the velvet beans, horse or sword, beans, the cow-peas, the beggar weeds, the crotalarias, etc. A sprinkling of slaked lime—not over a pound per tree once or twice a year will sweeten the soil and release some of its plant food—if you allow it to get *into* the soil. Never apply any kind of fertilizer in heaps nor near the base of the trunk.

The prevention of infection is the most important matter for the planter to consider at present. It is a large and long subject; let us put it briefly. Never make a cut—not even in picking a pod—without immediately applying a spore-proof dressing. This substance should be waterproof, should dry without cracking, should not poison the contiguous tissue, and should be plainly visible. Resin oil thickened with manjak or even with fine clay is nearly perfect. Tallow added to pine tar helps to prevent the washing off and also the burning of the bark. Any of the ochre paints are very good. The sponge attached to the pod-picking tools must be kept wet with some aseptic dressing. By the way, I do not expect many planters will use the pole pod-picker at once, but I must urge everyone who wishes to treat his trees properly to pick all pods that may be readily reached with the shears. The pod stem should be cut rather close to the cushion, and the dressing applied with the same motion which severs it. Fortunately in *no* instance have I failed to readily convince a planter that the terrible condition of the cushions and consequent loss of a large per cent. of the young pods is due to decay—the rotting back of the pod stem or infection through a cutlass or goulette wound. Once those insidious spores of *Lasiodiplodia* get into a cushion, there is little chance for a pod to ever ripen on *that* cushion thereafter. You may get seven or eight mature pods from one cushion at a picking, and you ought to get many crops from each cushion; but with the present abundance of said spores, the past methods mean death to the fruit-supporting organs of the tree. If loss of tissue were the *only* bad results of fungus infection, the planter would be able to pick a large part of the pods which die young at all times, but especially during "change of leaf"; but the poisoning of the sap flowing past an infected portion of cushion into the "chilero's" soft stem accounts for the terrific death-rate among young fruits. Indeed, if a decay spot exists anywhere on the branch, the whole sap supply of that branch is not only reduced but vitiated. And, worse still, a tree which has received a dozen or more wounds near the base of the trunk has all it can attend to in attempting to heal over those wounds and fight the cancerous canker which enters thereby without making any pods, though it may try to put out a few weak flowers.

This is not the place to discuss the difference between the *Nectria* and the *Lasiodiplodia* cankers, nor to dwell upon the numerous secondary fungi attacking the leaves, pods, and bark of the cacao; all these pests should be thoroughly investigated at once. You have been told, I believe, that the oozing of gum and claret-coloured liquid is the "*first* symptom" of canker—it is, gentlemen, the *last*,—the effect of bacteria feeding upon the dead material left by the fungus. Don't attempt to treat diseased cushions,—you haven't time. But with gouge chisel and mallet, farriers' knife, hatchet, and (if you must have it) the short sharp cutlass, remove all dead or dying tissue whether bark or wood that might continue to menace the trees' health. You need not cut out *all* the dead wood if in a cavity, provided you apply an antiseptic dressing. Open up the shallow cavities so that water will readily run off. Fill all deep holes with the clay-fibre mixture; remove as much of the dead wood from the hole as

convenient; apply the oil or other liquid dressing to the walls of the cavity and to the surface of the filling (which should also contain a small quantity of the same liquid). Don't cut more healthy wood than absolutely necessary in treating cavities, canker areas, and scars. On the other hand I believe the shock to the tree from a fresh wound which is immediately dressed is less dangerous than the sap-poisoning effect of decay. Remember there is practically no such thing as *natural* death in any part of the cacao tree excepting the flowers. That is why I think you should remove undesirable suckers rather than allow them to die and perhaps infect the adjacent tissues; when a dozen suckers start from one small area it follows that some at least must perish and a cut—one that can *heal*—is far better than rot. But right here let me say that you should not trim or cut at all if you cannot do it *well*. Viciously, or at least carelessly, made wounds cost the planters here many thousands of dollars annually. Overpruning also causes incalculable losses on many estates through the shock to the tree and the direct loss of wood; I would like to go into this subject further.

No estate can afford to be without a sanitary gang composed of the *best* of the labourers any more than the proprietor can afford to have no medical treatment when he is ill. Every pod dead or dying must be removed; all trees should be visited for this purpose every ten days or oftener if possible. It is not *necessary* to bury or burn these decayed fruits which are usually covered with various kinds of spores. Of course there is some danger of spores from these black pods left on the ground getting back on to pods or into wounds, but 99 per cent. of the danger is removed by getting the sources of said spores down out of the air-currents on to the soil where the spores themselves even in dry weather are soon killed or greatly weakened. The size of these dead pods is immaterial. The same tools should be used as in the regular picking; however, a piece of tarred gunny sack on the end of a bamboo will remove most of the black "chileros" from the upper branches. The *principle* of dressing the cushion end of the stem of a dead pod is good, but the practice is rather like that of locking the stable after the horse is stolen, for the decay of the stem of a dead pod can kill a cushion just as quickly as a slash from the death-dealing cutlass. There is not much use to spray old trees that are full of disease inside; Bordeaux mixture cannot penetrate plant tissues,—it is effective only on the surface. But if you put a few drops of Bordeaux upon a pod it will be nearly impossible for any spores to even germinate thereafter on the surface of that pod. Therefore, spray all pods (after removing the dead ones of course) on all young trees. If you save even one pod to every five trees sprayed you will get your money back and, I hope, acquire the spraying habit.

Indirect sanitation comprises a multitude of measures. Only a very few planters appear to realize the enormous importance of wind-belts in and around cacao plantations. I am sorry that extended experiments have not been carried out here to ascertain just which trees and shrubs will give the best results under the several conditions to be met with. There are so many good leguminous trees which should be tried—some for hilltops, others for wet lands! Why, even among the many varieties of rubber trees you have only four—two good ones! and it appears but one of the four or five kinds of *Castilloa*! none of the South American Sapiums in sight! The deplorable delinquency in *this* direction is nearly as bad as in regard to cover crops. Please remember that a wind belt should be as near air-tight as possible; don't hesitate to sacrifice two or three rows of cacao, or even *more* on the brow of a hill, for the sake of a good thick screen whether of rubber, legumes, or, better still, of a mixture of both.

Many of the more perspicacious planters are beginning to see the ill effects of overshading; a few don't believe in shade at all. To be sure, the immortelle has a few good points: it is a *fair* wind-break—provided the winds are not strong; it keeps down weeds—by keeping out the light and thus causing cacao indigestion in the stomachs, or leaves, which cannot properly manage the raw sap from the roots unless the actinic rays of sunlight can assist the enzymes; it entertains in its root nodules a good grade of bacteria which condense a good quantity of atmospheric nitrogen—but being a surface feeder like the cacao (or *more* so) it robs the cacao roots of a large share of their rightful food. We haven't time to discuss the many bad points of the two immortelles. Some planters believe the cacao enjoys the humid atmosphere under the shade of the "madre (or better, *suegra*) del cacao"; possibly it *does*; anyhow the fungus pests simply revel in it.

Though I've never caught a labourer in the act of mangling cacao roots with a fork and cutlass, I have seen a number of instances where this crime had been perpetrated—and then spoken of as

forking. This is a painful subject, gentlemen. Please remember that the tree feeds only at the *tips* of its roots, and that the roots are at least as long as the branches. The root system of the cacao is comparatively weak; don't weaken it. It is not such a dreadful sin to amputate branches—if you believe you are doing right therein; but tread softly when you walk over the *roots.* Coax them down away from the soil surface by letting in air and food through the vertical openings made by fork prongs. Fork lightly and generally,—except in rainy weather.

You have heard enough already of the live mulch cover crop idea; I am delighted to learn that promising results are already in evidence. Besides renovating and protecting the soil, the web of vines helps to retain the layer of decaying vegetable matter on the soil surface, the extract of which would otherwise go down the drains with every rain. Fortunately most estates are pretty well drained. However, in some cases I find the middle of the bed not quite so high as the edge of the drain. Make the drains deep rather than wide and let them run obliquely, of course, instead of straight down a slope. Throw the worthless sub-soil earth in heaps, instead of ridges, and don't haul it back till it has had time to "sweeten up" a bit.

About weeds. Some strike at the root and thereby frequently kill,—"weeding"; others merely *pollard* which in the case of grass, especially, rather tends to encourage a thickening of the clumps,—"brushing." Weeding is, of course, more expensive but much more efficacious. I would recommend a lighter hoe than the one in general use here. Some weeds must be piled in heaps, buried, or carried out of the plantation to avoid re-sprouting.

There has been trouble enough over the pruning subject already, but I must touch upon two or three points. A few planters believe that if you remove a sucker, or chupon, two or more will always follow in its place; but that depends upon how the cut is made and whether the wound becomes infected and the adjacent tissues thereby inflamed. Cut close and clean and dress instantly when you remove suckers or branches. Don't hesitate to prune suckers; you can make them branch at any height you please. Don't regard them as parasites; they are young trees and can bear pods when only three-quarters of an inch in diameter. Few planters have due respect for the chupon; two have even strenuously asserted that if you cut back a chupon it will always put out obstinately just *one* shoot. With chupons, "renews" from the very base of the trunk, and "palmas" from the large branches, you can rapidly make over a half-dead old tree into a prosperous new one. Don't hesitate to cut a dying tree however; if it dosen't already have one or two healthy young renews it soon *will* have, unless the root system is badly affected. By the way, don't leave more of the stump of a cut tree than necessary for the sake of the renews, because two of the three (?) kinds of *Lasiodiplodia* spores are spread more frequently thus than in any other way, I believe; however, one brown-rot pod *may* produce several millions of those terrible black spores sticking together in snake-like coils twisting up out of the black crater-like *pycnidia.* Don't leave any dead wood, which you suspect to be cankerous, exposed in the plantation; it yields plant food in decay but unless covered and made to rot quickly it may breed not only spores but wood-boring insects.

It is out of my province, perhaps, but I wish to suggest that the labour should be classified more than it is on most estates. You need specialists and you should *make* them take an *interest* in their work; I believe there is no better way than to give every man who has any responsibility on the plantation a percentage (as *small* as you like) of the nett profits; bonuses are good, but percentages are better.

Let us all leave the trade word "cocoa" for the manufacturers. This is one of the very few *cacao* growing countries of the world wherein that old mistake is kept up.

Trinidad has long been looked up to by other countries as the best cacao field where the best methods of culture are employed; but I fear her place of honour will be lost within a few years unless the Government and this Society take certain matters seriously in hand and assist the planters to a better appreciation of their most excellent advantages and to a fuller realization of their magnificent possibilities. Trinidad planters are by no means alone with their troubles. The other cacao countries suffering heavy losses from similar causes, are watching you. Now is your time to show them that Trinidad means to hold her position, as I earnestly hope and believe she will—to surpass them all in the culture of one of the most important crops of the world. Gentlemen, it is up to you. (Applaue.)

THE DISCUSSION.

His Excellency:—Does any member wish to ask Mr. Barrett any question with regard to his paper?

Mr. Swanston :—I would like to ask him whether the immortelle gives water to the cacao tree or not, or whether we can do without it. I would be glad if he could tell us whether the immortelle is of any help at all to the cacao. I asked that question two years ago of Mr. Hart?

Mr. Barrett :—That is too big a question to be answered in a short time. As I said in a previous address, it is a favourite belief (utterly unfounded I feel sure) among planters that in a dry spell, the immortelle says, as it were, to the cacao : —"Here! I have plenty of water, you are suffering, let me give you some." They seem to believe that the water in the immortelle root is yielded up and goes into the cacao roots. But I cannot understand how a man can believe that, if he stops and thinks what roots are and what roots do. It is beyond my imagination to conceive water getting from one root into the soil and over into another root! Of course we must remember that the shade given to the soil by the immortelle branches and leaves—when they happen to be on—*does* keep the moisture in the soil; and in that way you might almost go so far as to say that the immortelle indirectly assists the cacao to keep the moisture in the soil, which without the shade would crack; and once a crack is formed in the soil it acts like a chimney, and every particle of moisture goes out. Most of the planters notice the dangerous drying and cracking of the soil where an immortelle has fallen or died out, and probably that is responsible for the widely prevalent and strongly rooted idea, that you cannot grow without immortelle shade. I repeat that if you properly shade your soil by any thick leguminous cover crop, thus keeping in the moisture, your plants will have less indigestion by having more sunlight.

His Excellency :—I am very sorry that the notice given for this meeting was very short, and I had already made another engagement which I have to keep now that I have got notice of it. I am very pleased to have had the pleasure of listening to Mr. Barrett's interesting and instructive paper, and with your permission I will ask Dr. Morton, Vice-President of the Society, to take the chair.

His Excellency then retired.

Mr. R. W. Gordon :—I would like to ask Mr. Barrett what time he recommends for the spraying of pods,—and how long each application will last, bearing in mind the rainy and dry season?

Mr. Barrett :—Bordeaux mixture properly made will stick from four to eight weeks.

Mr. Gordon :—During the dry as well as the wet season?

Mr. Barrett :—Yes.

Mr. Swanston :—I don't know if Mr. Barrett has seen the groundnut growing as shade. That does not climb at all, and I think it is beneficial to the man planting it, and would be good for the cacao also.

Mr. Barrett :—It is not quite the thing to be used as a cover crop for several reasons which I have not time to state now. I must simply advise against the groundnut, or peanut, as a cover crop.

Mr. Swanston :—I can show you I have peanut growing now in shade as mulch.

THE COCONUT INDUSTRY IN TRAVANCORE.

Of late there has been an unprecedented increase in the price of coconuts and other products of the coconut palm, and it is very unsatisfactory that no attempts are being made either by the people or the Government to improve this important industry in Travancore. "It is," as Mr. G. T. Mackenzie, who was for some time British Resident in Travancore and Cochin, remarked, "the plain truth that Travancore lives on this tree. The wharves at Allepey and Cochin are covered with the various products of the coconut—barrels of oil, tons of kernel, bales of coir which from these ports find their way all over the world." Without the money obtained by this export of the coconut, the people of Travancore could not buy from Burmah the rice that keeps them alive, or from Jaffna the tobacco that keeps them contented. The coconut palm is an enormous source of wealth to Travancore, and the following trade statistics will bear out this statement. In the year 1079 (1903-04) 1080 (1904-05) the value of copra exported from Travancore was Rs. 14,96,514 and Rs. 15,45,112; coconut oil Rs. 13,77,622 and Rs. 13,07,762; coir Rs. 38,10,076; and Rs. 39,12,499; fibre, Rs. 7,904 and Rs. 9,627; and coconuts Rs. 3,87,679 and Rs. 3,21,714 respectively. In fact the trade in these several products represented nearly half the entire exports of Travancore. In addition to the above, there is the trade in jaggery, which on the average comes to Rs. 5 lakhs per annum. Thus it will be seen that coconut cultivation, while bringing in a handsome revenue to the State, gives support to a considerable portion

of the population who are engaged in the various industries arising out of the different products of the palm. The soil of Travancore is admirably adapted for coconut cultivation, and it is a surprise that the industry should have been so much neglected here. As a matter of fact, a good many of our best gardens have already undergone great deterioration, and the industry has almost ceased to be the source of national wealth that it was in years long gone by. It should, therefore, be worth the while of the State to look into the causes of this decline which has evidently been the cause of so much poverty in the interior.

DETERIORATION OF THE INDUSTRY.

According to a report published under the authority of the Government, we find that some thirty years back there were 8,518,358 coconut trees in Travancore. Recent accounts go to show that the number has become considerably less. It is in the coast-lying taluks of this State—Shertally, Vaikam, Kurunagapally, Mavelikara, Tiruvella, Chirayinkil, Trivandrum and Neyyathankara—that this palm is largely cultivated, though all the taluks contain coconut cultivation to a greater or less extent; and in all those localities this palm seems to suffer sadly from the many animals and insect pests which prey upon it at nearly all seasons. Besides these pests, the neglect on the part of owners to maintain and adequately fertilise their gardens has also been telling upon this industry. Much neglect is shown in manuring these coconut topes, and in consequence some of the gardens are gradually but steadily deteriorating. All that is usually done is to dig a hole round each tree and throw in a small quantity of cowdung, or ashes, or any of the other fertilisers which are commonly used by our coconut growers. The soil has been exhausted either through over-planting, or through existing plantations having been left without manuring for a considerable time, and it is a pity that the cultivators do not seem to understand that it is not possible, without generous manuring, to keep the trees in healthy condition. Needless to say, a good deal depends upon the proper cultivation of this palm. It is a littoral plant attaining earliest maturity, great size and greatest fruitfulness close to the sea, where, if the soil be loose and friable, even though of the most meagre description such as sand and shells, it grows luxuriantly without the aid of special cultivation: manure or the proximity of inhabited houses. According to Simmonds, the following soils are considered suited for coconut cultivation: Soils mixed with sand either dark-coloured or river-washed; sand mixed with clay, ferruginous earth or black mould clayey soils with sandy under-strata; sand and clay even when mixed with gravel and pebbles; seashore and banks of backwaters; rivers, tanks and paddy-fields; alluvium of rivers and backwaters; marshy lands even in brackish soils; all level lands exposed to the sea-breeze where the soil is good; and the floors of ruined houses and other places frequented by cattle and human beings.

FORMING THE NURSERY.

Having pointed out the different soils suited for coconut cultivation, we shall now deal with the formation of coconut nurseries; for the greater the care taken in regard to the seedlings, the richer will be the yield of the plants. In plucking coconut for seeds, very young and very old trees are to be avoided, the fruits of the middle aged trees being the best suited, the gathered nuts should be tied up in pairs and thrown on the roof of the houses, and left there for a couple of months—that is to say till they sprout—exposed to heat and moisture. Seedbeds, as a rule, should be prepared two feet deep and the nuts planted one foot apart. Ashes and salt, and in places where soil is saltish, ashes alone should be put in the trenches. This not only tends to produce healthy seedlings, but also protects the seedlings from the attacks of various insects. Watering is required till they take root, and then only once a day. They might be transplanted when six or at the most nine months old. In Shertally and other parts of North Travancore, the seedlings are allowed to remain in nurseries until they are two years old. It is, however, advisable to transplant them early, when six months old. Again, in transplanting, the trees should not be planted too close together, and the pits should ordinarily be five feet deep. Regarding the best method of cultivation, we would draw attention to the cultivation of this tree in the Bombay Presidency, where it is extensively cultivated in the districts of Kanara, *Ratnagiri*, Kolaba, and Kathiawar. In those places, in starting a coconut garden, a bed is prepared, and in it, at the beginning of the rainy season, from twenty to forty large, ripe, unhusked nuts are planted two feet deep. The seedlings are left undisturbed for two years. They are then, at the beginning of the rains, planted in sandy soil in rows about 18 feet apart, and with a distance of 15 feet between the plants. For about a foot and a half round each plant the ground is hollowed three or four inches deep, and during the dry months the plants are watered daily or

once in two days. The cultivators there do not in the least stint the manuring of the trees, which in their turn give sufficient fruit. The trees in Bombay and other places begin to yield nuts after six years, whereas ten years seem to be the maximum period required for coconut trees in Travancore to bear. Of course, in certain parts where the soil is exceptionally favourable the trees begin to bear in four years from date of planting. In Travancore the trees bear in plenty during the months of January, February, March, April, May and June. The following are the different varieties of the coconut palm that thrive well in Travancore soils :—Chontengu, Gualipatram, Nokkuvari, Kappaltengu, and Yappanam. The Travancore cultivators, as already said, do not pay any attention to manuring the trees. It may be mentioned that fish manure is the best that can be used.

COCONUT PALM PESTS.

We may now discuss the coconut pests which have been the main cause of the decline of this industry in Travancore. It is a matter for surprise that people of this country, who have been cultivating this tree for many centuries, have not yet devised some satisfactory remedies for dealing with its enemies. It is true that some poor makeshifts are resorted to by way of protecting the trees from the pests ; they do not, however, seem to be of much use in checking the trouble. Without enumerating in detail all the enemies against which the coconut tree in Travancore has to contend, we may mention the white ants, beetles and worms ; of these the white ants can only harm the plant in its infancy. It is when the trees get old that the other two begin to commit havoc. There are two varieties of beetles—the red beetle (*Rhynchophorus sacha*) and the horned beetle (*Oryctes rhinoceros*) that does the greatest mischief; it attacks the terminal bud of the stem, and as a result the bud dies and the crown of the leaves falls off, leaving the coconut tree a mere bare stem. The red beetle only attacks the nuts. Prevention would seem to be the only cure for these pests.

THE ROBBER CRAB.

There is another enemy called the coconut crab (*Birgus latro*). This is also called the robber crab of the Keeling Islands, and the story of their climbing these palms at nights and detaching the nuts seem to be almost fabulous, According to one account, it is said that, in order to extract the nourishment, it tears off the husk fibre by fibre, from that end in which the three eyes are situated, and then hammers upon one of them with its heavy claws until an opening is effected. It inhabits deep burrows, where it accumulates surprising quantities of picked fibre of coconut husks on which it rests as on a bed. Then there is another enemy—the rodent —and it is the most wanton, the most ingenious, and the most destructive of them all. Man with all his ingenuity has not been able up to the present day to apply the least possible check to the depredations of the rat, which seems to be the craftiest and most destructive of the animal enemies to the plantations. It is said that the rats build their nests in the hollow of the base of the coconut frond and feed on the tender leaf, the young kernel and the mature nut. They seem to commit these depredations out of pure mischief. It is not exactly to satisfy the demands of hunger that they do it, for, in that case, why should they wantonly nibble at and throw down unripe nuts ? In the Laccadive Islands, where many coconut plantations have been practically ruined on account of these rodents, the people get up rat-hunts and slaughter thousands ; but there has evidently not been any diminution in their numbers, the rats being the most prolific of living creatures. Various remedies have from time to time been tried, but with very little purpose ; traps, poisoned baits, cats, etc., do not seem to be of much use.

AN INFECTIOUS PALM DISEASE.

There is also another disease caused by a kind of fungus of the genus *pythium* (a near ally of the phytophthora, found in Koleroga), which has been doing much havoc all over the coconut plantations in the Presidency and elsewhere. It is now more than a dozen years since this infectious disease was first noticed in Karunagappally Taluk in Travancore, whence the neighbouring taluks have also caught the disease. Mr. Butler, Imperial Mycologist, Agricultural Research Institute, Pusa, makes the following remarks regarding the disease in his article on "Disease of Palms" in the *Indian Agricultural Journal:* "The earliest sign is an alteration in colour in one of the leaves, usually one of those recently expanded towards the centre of the bud. This turns white, and soon afterwards commences to wither. Other leaves are attacked in turn, the heart of the bud is reached, and the whole top withers and falls off, the last stage often being reached only after considerable time. In coconut palm the same general course is followed ; but here, if the nuts have been formed before the attack becomes severe, they are often dropped prematurely. No new nuts are formed once the characteristic symptoms show. . . . .

The expanded parts of the leaves are, it is true, unaltered and apparently healthy until withering sets in. In the leaf sheaths, however, the signs of disease are unmistakable." It would appear that the infection is carried to other trees by the wind, by the knives of the toddy drawers, and by certain insects. Mr. Butler has suggested two remedies—one to arrest the spread of the infection by cutting down and burning the affected trees, and the other to prevent the diseases taking root in the trees by disinfecting all healthy trees with Bordeaux mixture. It has been found in Jamaica and other places that by the use of this mixture the disease may be checked in its earliest stages. Dr. Erwin Smith, who had occasion to study the nature of this disease in Cuba in 1904, believes it to be a bacterial one and has suggested the same remedies. Thus, different pests, coupled with the indifference of the State and the people, have been the cause of the partial ruin of this famous industry in Travancore.—*Indian Agriculturist*, Vol. XXXII, No. II, November 1, 1907.

ADVANTAGES OF TRANSPLANTING PADDY.

The following article on "The Advantages of Transplanting Paddy" was contributed to the August number of the *Agricultural Gazette* of the Central Provinces, by Mr. D. Clouston, M.A., B.Sc., Deputy Director of Agriculture, Central Provinces :—

The five methods of sowing paddy practised in these Provinces are known as (1) transplanting, (2) biasi, (3) broadcasting without biasi, (4) sowing in lines, and (5) lehi. Where transplanting is followed, the seed is first sown in a well-manured nursery bed, and when the seedlings are about 9″ high, they are planted out in the plots where the crop is to be grown. In biasi the seed is first sown broadcast, and the plants are afterwards thinned out by working the country plough in the field. When this thinning process is omitted, the seed is sown broadcast without any subsequent biasi and the method is known as broadcasting. In the process known as lehi, the seed is artificially germinated and then sown. By the fourth method, the seed is sown in lines by means of a light thr e drill. This latter method is but seldom practised in the Provinces, and has not, therefore, been included in the experiments of the Raipur Government Farm. In an article which appeared in the November number of this Gazette in 1906, a detailed account was given of the method of transplanting; this article will deal with the results obtained from experiments conducted on the Raipur Farm in which this method is compared with the other three commonly practised. These experiments were carried out in Series A. and B., A. being irrigated and B. unirrigated. Both series of plots were uniformly manured with cattle-dung at the rate of 20 lb. of nitrogen per acre. The plots were each one-tenth of an acre in area.

The transplanting plot has done best every year, and has yielded a nett profit that is double that of the second best plot. It is often stated by cultivators who have never tried transplanting that it is suitable for irrigated paddy only, and that even then it is not profitable on account of the additional cost of labour involved. The results of this series of experiments prove that both these statements are doubtful, for the plots were not irrigated, and in calculating the profits derived from them the cost of cultivation has been deducted in each case. Transplanted rice grown under irrigation gives a still higher profit, despite the fact that the cost of cultivation in this case is still increased by a water-rate of Rs. 1·14 per acre. With the exception of broadcasting, transplanting is the cheapest of all the methods experimented with, as it reduces the weeding charges very considerably. The weeds are so thoroughly eradicated by the ploughing given to the plot before transplanting that after-weeding is seldom necessary. The figures given above show the actual cost of cultivation by each method on the Raipur Farm, from which it will be seen that the extra cost of transplanting is much less than the extra cost of weeding, entailed by other methods of cultivation. A most important factor in the cost of cultivation is that, whilst biasi requires about 80 to 100 lb. of seed per acre, transplanting requires only 20 to 30 lb. of seed per acre.

In the Chhatisgarh Division of these Provinces there are about 28,50,000 acres cropped annually with paddy, out of which only about 37,750 acres are transplanted, so that this method is seldom practised. The annual monetary loss suffered by the cultivators in consequence must amount to crores of rupees. One of the most important lines of work now being taken up by the Agricultural Department in this tract is to demonstrate the advantages on this method on small Demonstration Farms. By presenting this method in all its details on a field scale, it is believed that it will recommend itself to the rice-growers of this tract, and that it

will be the means of materially adding to the farming profits of this class. The rice cultivators of Chhatisgarh should give a careful trial to the system of transplanting. The outturn is much larger than by the biasi system, and in ordinary years the crop will grow quite as much without irrigation. Transplanted rice requires more rainfall, but there seems to be no good reason why this method should not be followed in all rice land commanded by irrigation.—The *Indian Agriculturist,* No. 1, 1907.

REPORT ON THE RICE INDUSTRY IN THE UNITED STATES.

BY MR. E. SEYMOUR BELL,
British Commercial Agent in the United States.

(*Continued from p. 45.*)

SEED.—Great care is used in selecting seed that it be free from self-set rice, weed seed and the seed of injurious grasses, that the kernels be hard and flinty, solid and of uniform size. Uniform kernels are valued because they permit of a higher polish than do kernels that vary.

Japanese growers consider the following points important for the successful growing of rice :—

1. The seed should be pure-bred, of even quality and size of grain.

2. Any light or imperfect grains should be removed. This is done in Japan by soaking the seed rice in water several days till it is about ready to sprout, when it is thrown into salt water of 1·3 specific gravity and allowed to remain two minutes, being gently stirred meanwhile. The light grains will float, the others are removed, washed in cold water and planted. When a seed drill is to be used the damp seed is first dried by being rolled in the ashes of rice straw.

3. Even sprouting of the grains is very essential to even ripening of the crop. This is accomplished by previously soaking the seed as above stated.

The seed is sown in March and April. A later crop is sometimes sown in June. For this the white seed is used on account of early maturity. The time of sowing, also, differs in different sections, and is affected by weather conditions and the movements of the bobolink (rice-bird). Sowing is usually done as soon as possible after the ground is put in condition.

Rice is generally planted with a drill in rows 14 inches apart and covered by means of a harrow. The drill is gauged to put in from 54 to 81 lbs. of unhulled seed to the acre. In some fields trenches about 2 inches deep and 14 inches apart are made with trenching hoes and the seed dropped in and covered. Sometimes, in order to save time and labour, the trench is left open, the seed having been clayed in order to prevent it from floating when the field is flooded. This is the open trench method, and for it the seed is always clayed. Claying consists in stirring the seed in clayed water until a coat of clay covers each grain.

In the North Carolina uplands the common corn drill is used in planting. Planting with a drill insures equal distribution, one of the essentials for the greatest productivity of a given piece of land. The amount sown per acre varies; the average, however, is estimated at three bushels.

In some localities birds steal the grain while it is being sown. To prevent this the seed is sometimes tarred, *i.e.*, given a coat of tar. This method, though a protection, is not an absolute one, as birds have been killed whose craws were filled with the black grains, and whose flesh itself tasted of the tar.

FLOODING.—One of the most important features in the culture of rice is flooding. Many planters flood the field immediately after the seed is sown, planting and watering on the same day. This water, called the "sprout flow," protects the grain from the birds and causes germination. The sprout flow is left on the field till the seed sprouts. In early planting this requires from six to eight days. Rice planted in June sprouts in twenty-four hours. When the sprout-flow is taken off the field remains without water until the plants come up, and the rows across the field can be plainly seen when the water is again turned on. This is called the "stretch flow," and remains on the field until the plants are 5½ or 6 inches in height. This requires from two to six days, the time depending very largely on weather conditions. The stretch-flow serves the double purpose of rendering nourishment available to the rice plant, and impeding and destroying the growth of weeds and injurious grasses.

When the plants have grown sufficiently high under the stretch-flow, the water is gradually lowered to an average depth of 4 inches, where it remains from 13 to 30 days, according to the strength of the soil, the condition of the plants and the temperature. The stretch-flow is taken off and followed by the "dry growth," which lasts from 40 to 45 days. During this period the crop is cultivated

with horse and hand hoes. All weeds, grasses and self-set rice are uprooted and the ground thoroughly stirred. It is during the "dry growth" that conditions are most favourable for grubs, and an intermediate flow is sometimes necessary to protect the crop from these worms.

When the plant begins to joint the "harvest flow" is turned on. First, the water is raised till it covers all the high places in the fields, and is held so for three, four or five days, after which it is lowered to where the stretch flow was. In a few days the water is again raised till it almost touches the rice heads, where it remains till the grain is ripe. The harvest flow extends over 65 days, and, in order that the water may not become stagnant, it is shifted every ten days. When the grain is ripe the heads bend low. The field is then drained for harvest.

Some fields require more water than others, and by careless irrigation a volume of water many times in excess of that actually needed may be used. The amount of water used, however, is of very little importance, as the supply is almost unlimited, and as to questions of water rights there are none.

WEEDING.—During the rice growing season harmful weeds and grasses grow on the banks and in the fields and ditches. These weeds and grasses must be cut down and their growth prevented. Hand weeding is very effective, and the consequent loosening of the soil is very favourable to the growth of the crop.

In cultivating this cereal the horse hoe, a kind of plough, and the common hand hoe are used. Under the best cultivation the field is horse-hoed once and hand-hoed twice. Where the drainage is poor the horse hoe is not taken on the field and all cultivation is done by hand.

The needs of the rice plant require that the ground be thoroughly stirred. This places food within reach of the plant and prevents a rapid drying of the soil. Rice cannot be grown here successfully without cultivation. The application of water cannot take the place of hoeing. On irrigated land the top surface, often flooded, becomes a paste. This when dried beneath a scorching sun becomes hard and baked and forms a crust that arrests the growth of the plant.

HARVESTING.—In the Georgia and Carolina States harvesting machinery is not used. All the rice is cut with the sickle. The beds, in order to permit of complete drainage, are made very narrow and usually small. For this reason the harvester cannot be used without great loss, owing to the amount of grain broken down and wasted in using the machine.

Rice is cut when the straw barely begins to colour, when the lower part of the head (about one-eighth) is still "in the milk." If cutting is delayed until the entire head is quite ripe, the quality is inferior and the quantity greatly reduced by the loss incurred by shelling out in handling.

It is cut 10 to 12 inches from the ground, leaving a high stubble on which the grain is laid to cure. In about 24 hours, when the grain is thoroughly dry, it is bound into sheaves, tied with straw and shocked. The labourer waits in the morning till the dew passes off before making the stook. As soon as possible, in order to avoid the danger of storms, the sheaves are taken in carts and wagons to the threshing mill, one of which is placed on each plantation. Some planters have a "stacking yard" on high ground, safe from floods and storms, where, after the grain is cut, it is carried and stacked.

Harvest work is given in tasks to coloured men and women. They cut, tie and put the sheaves in stooks for 2 dol. per acre.

THRESHING.—Threshing is done on nearly all plantations with a steam thresher not unlike the machines used in threshing wheat. The machines are stationary and very large. Threshing mills are erected on tide-water canals or on the banks of streams, in order that tugs and lighters may come to the mill and carry the produce to market. In the process of threshing the grain is thoroughly cleaned by fans and screens, which remove all the light and inferior grains, chaff, &c., from the maketable article. This is then carried by elevators into large bins, where it is stored. Great care is taken that the grain be thoroughly dry before threshing.

The rough rice or paddy, as it is taken to the mill, has two coverings, a thin, close cuticle, encased by a coarse, thick, stiff husk. Milling consists in removing these coverings. In the process 20 lbs. of husks are taken from 100 lbs. of paddy.

The grain is usually brought to mill in boats and taken from the boats by elevators. The first operation the paddy undergoes in the mill consists in recleaning, after which it passes between milling stones, distant from one another by about two-thirds of the length of the grain. These tear off the husks, and, as the product passes over screens and bellows, the chaff and grain are separated. The grain is now placed in mortars, wherein the cuticle is removed by pounding

with pestles. When the cuticle is removed, the contents of the mortar form an oily mixture of rice flour and chaff. This now passes over "flour screens," by means of which all flour is removed. The "chaff fan" is then used, and the rice delivered as clean grain is run into cooling bins. In the preceding processes so much heat has been generated that cooling is necessary. For about nine hours the grain remains in the cooling bin, after which one more separation takes place. By means of "brush screens" the large rice is separated from the smaller, and the little flour that has not yet been removed is brushed from the grain. The product is now ready for the final process-polishing.

Polishing.—The commercial article is always polished. This consists in giving the grain a glossy appearance, and makes much difference in the market value. The process that gives the gloss removes much of the most nutritious parts of the grain, including nearly all of the fats and most of the flavour. The food value of rice flour is many times greater than the food value of the polished product. Polishing is effected by pieces of skins passing over the rice and by giving a thin, fine coat of paraffin. Within a cylinder of wire gauze revolves a cylinder of wood, around which sheep-skins are tacked, wool inside. This gives a soft surface, over which tanned skin, worked to a velevt-like softness, is fastened. The grain, with a piece of paraffin, is put into the large cylinder. The cylinder revolves, and passing the soft surface over the grain gives the pearly lustre.

Rice Straw.—For a long time rice straw was regarded as waste and burned in the field. Sometimes it was used as fuel at the threshing mill, as is the custom still with some planters. This straw, however, has a practical food value. It contains proteins, fats and carbohydrates in such proportions as to be a good forage for stock. In recent years it has been baled and placed on the market for packing purposes.

Cost.—The initial expenses are, of necessity, heavy. The average cost to do necessary grading and prepare clean ground is about 25 dol. per acre. Timbered land may be cleared for about 75 dol. per acre. The cost, therefore, of converting timbered land into a rice field, with its canals, banks and ditches, is about 100 dol. per acre. To put the ground into condition, cultivate, harvest and prepare the grain for market costs the planter from 20 to 25 dol. per acre. For milling and handling by a broker, the expense the planter must meet equals about 20 per cent. of the value of the product.

In the rice belt factors furnish the planters money at 8 per cent., and usually take a lien on the crop, real estate, farming implements and outfit. The crop is delivered to the factor, who sells it for a commission of 2½ per cent. Planters who are not obliged to borrow money sell through a broker at an expense of 1½ per cent.

Labour.—Labour is done by coloured men and women. The prices paid vary but little, and range from 40 to 50 c. per day. Labour is generally given out in tasks at 40 to 50 c. per task. Some planters contract with the labourers for a year's work. The labourer receives a given tract of land, usually an acre, on which to raise rice for himself and family, a cabin, wood and all the upland he wants for vegetables. For this he agrees to work one day of each week for a year or eight or nine months, and during the remaining time for a stipulated sum per task.

All fields are laid off in half acre divisions, called tasks. To hoe one of these divisions or to plough three of them constitutes a day's work. Harvest work is given out at 2 dol. per task.

Good rice generally brings from 60 c. to 1 dol. 15 c. per bushel. It does not often sell for less than 60 c., and seldom brings more than 1 dol. 15 c. Upland rice is not so valuable as the lowland product, which brings about 20 per cent. more. The upland culture in many parts of North Carolina has of late years been almost discontinued on account of the low price offered for the product.

Before the Civil War the planter realised 4 or 5 per cent. on his investment in the rice business, valuing his slaves employed at from 500 to 800 dol. per head, and reckoning them as part of his investment. The planter now realises from 6 to 10 per cent. on the investment.

Damage by Storms.—The principal and greatest loss sustained by the planter is due to storms. In 1803 all the fields along the Combahee, Edisto, Savannah, Ashpoo, Cooper, and many other streams were devastated by storms. The water beat against the banks and *levees* till they gave way, rushed in and rolled over the fields, destroying the grain, filling up ditches and canals, and creating havoc generally.

Self-set Rice.—In harvesting more or less seed falls to the ground, especially at places where sheaves have been stacked and along the driveway from the fields to the barnyards. The seed that is not destroyed by sprouting and burning remains in the ground and grows up with the following season's

planting. The self-set plant produces red rice, so called because of the pink cuticle next to the kernel. The great objection to red rice is that it is so soft that it cannot be milled, and is, therefore, unmerchantable. The grain scatters out readily, and, re-seeding the field, produces more and more of its kind. In some instances it has increased so rapidly and taken so firm a hold of the ground that it has been necessary to leave whole fields idle for a year or more in order to free the ground from the intruder.

To eradicate red rice the field is flooded immediately after harvest. This sprouts the scattered grain. Late in the autumn, when it has grown up, the field is drained as dry as possible and then burned.

Rice Pests.—Ricebirds, blackbirds, grubs, maggots and worms are the principal pests of the rice fields. Of these, the most troublesome is the ricebird, commonly known in the north as the bobolink. Early in the spring the bird begins to migrate from the extreme south, and arriving in the rice belt about planting time, preys on the seed that has been scattered. Or, arriving a little late, when perhaps the crop has sprouted and shoots have been formed, the bird pulls up the plant, roots and all, and feeds on the sprouted kernels. Its stay in the field this time, however, is short, as it moves on northward to nest.

When nesting is over, and the young have become sufficiently strong, the flocks unite and begin their return to the south. They arrive in the rice belt about the middle of August. Thereafter, until their departure, there is trouble for the planter. The birds swarm on the fields in countless numbers, and are driven from one place only to settle down on another. If the grains have hardened before their arrival but little damage is done, but when the grain is "in the milk" great quantities are devoured, and the loss at times has been so great in places that it was found unprofitable to cut the grain. When the grain is palatable the invasion of these birds is ruinous.

The preventatives employed against these birds are only palliative, and the expense incurred is considerable. Men and boys armed with muskets and shotguns discharge blank cartridges to scare the birds away. Shot is seldom used as it damages the crop. One man imperfectly protects 4 or 5 acres, and shoots about one quart of powder per day. Firing commences at daybreak and continues until night. These men and boys are called "bird-minders." Small flags and kites, some with suspended looking glasses, are flown over the fields. Another method consists in placing a piece of stale meat on a pole in the rice field. This attracts buzzards. The ricebird, for a while, takes the buzzards for hawks and stays at a distance. Soon, however, the bird becomes accustomed to the buzzards and pays no attention whatever to them.

When the seed is sown to "meet the bird," *i.e.*, to be in the milk when the bobolink arrives, the entire crop will be destroyed if extraordinary care is not exercised on the part of the bird-minder. The average loss due to this bird is estimated in many places at 4 to 4½ bushels per acre. The blackbird is always about and ready to forage. The damage done, however, is but little.

Abandoned Land.—Much abandoned land lies along the southern rivers, where there is tide water. These lands are covered with a dense growth of marsh weeds. Many of these now abandened lands were once fields of industry and productivity. The soil is rich, and with proper irrigation and drainage would make good rice fields. Much of these tide water lands can be so reclaimed, and some of them are. Those that sold for 120 and 200 dollars per acre before the war can now be purchased for 50 cents to 1 dollar 50 cents per acre, so that if rice growing continues to be a success there is a good opportunity here for investments.

Bye-Products.—In the process of preparing rice for market the following products are obtained :—

First.—Rice bran or douse, which is made in grinding the rough rice for the purpose of removing the hull or chaff. It is made up of fine particles of rice splintered by the mill stones, and the eyes or germinal points of the grain.

This is good feed for hogs. When mixed with wheat bran or other mill feed it is admirable for horses and cattle.

Second.—Rice flour or rice meal, obtained in the process of pounding, and the skin (which lies between the chaff and grain proper), and the immature grains pulverised by action of the pestles.

This is a most nutritious article, rich in fatty matter and cellulose. Having a sweetish, pleasant taste, it is relished by all animals. It is recommended for horses, milch cows, sheep, cattle, hogs and poultry. It is best to mix it with

other feed for horses, as it is too rich by itself. It is recommended to begin with one-fourth rice flour, and after ten days increase to one-half. It may be fed to hogs the same as corn.

Third.—Polished or crushed rice, obtained by applying great friction to the rice to polish and make it smooth and white.

This is a fine white feed, filled with minute particles of rice. Though it does not contain so much fatty matter as the flour, it is recommended as a strong food, particularly for hogs and horses.

RICE MILLING INDUSTRY.—In a report issued by the Census Bureau, June 23, 1902, and covering eighty establishments, it is shown that since 1880 the number of rice mills in the United States increased 264 per cent., capital 363 per cent., and value of products 178 per cent. This report noted that the increase in Louisiana and Texas was very marked, their production having advanced from 75,753,856 lbs. in 1890 to 179,919,203 lbs. in 1900. The statistics indicated that the industry is being transferred from the South Atlantic States to Texas and Louisiana, and later reliable statistics have pointed out a continued change in this respect.

The growth of the rice industry in Texas is told in the following estimates of the acreage and production as far back as 1895, when its importance was first recognised :—

Year.	Area. Acres.	Quantity. Barrels.
1895	2,000	18,000
1896	5,000	50,000
1897	10,000	80,000
1898	18,000	180,000
1899	40,000	425,000
1900	70,000	500,000
1901	100,000	950,000
1902	200,000	—
1903	220,000	1,705,000

It will be noticed that the area planted almost systematically doubled in each of these years until 1902.

OTHER INDUSTRIES.—Besides rice mills, hulling and polishing the product, paper mills for utilising the straw and brush factories (for the roots of the rice plant make good brushes), are some of the industries which follow in the wake of rice and its by-products.

FEED VALUE.—Without going into the technicalities of the composition of food-stuffs, it is well to note that rice polish is practically the same as corn and meal, and, according to experiments conducted at one of the agricultural colleges, it was found that a ration consisting of 5 lbs. of rice bran, 11½ lbs. of rice polish and 20 lbs. of prairie hay produced gains in excess of a ration consisting of 8 lbs. of corn, 7½ lbs. of cotton seed and 20 lbs. of hay.

FARMING FINANCE.—The following figures on the expense and profits of a 1,000-acre rice farm may be taken as accurate :—

ESTIMATED COST OF LAND IN TEXAS, IMPROVEMENTS AND EQUIPMENT.

	Amount Dollars.
1,000 acres at 12 dol. 50 c. per acre	12,500
Boilers, engine and pumps erected ready for pumping ..	6,000
Necessary canal work ...	3,000
Fencing	600
Levees outside and contour ...	500
6 houses and stables	3,000
24 mules	3,500
6 sets of implements, harness, ploughs, discs, rollers ...	3,000
6 wells and 6 lots	400
Total investment ...	32,500

The above estimate will vary in the price of the land, which may be bought cheaper.

The estimates for the canal work, fencing, houses, &c., are based on contract, that is, hiring everything done.

If the farmers do this work themselves the actual cash expended would be reduced about 3,000 dol.

COST PER YEAR FOR OPERATING FARM AFTER IMPROVING.

	Amount Dollars.
Feed for 24 mules, in addition to pasturage	2,500
State and county taxes ..	100
Incidental expenses	100
Repairs	400
Extra labour during planting and harvest	1,000
Interest on investment used as a sinking fund	2,000
Fuel for operating plant ...	900
Engineer	300
Threshing and sacking ...	2,000
Living expenses for six families of, say, four each	3,000
	12,300
Seed rice	1,350
Total annual expenses ...	13,650

The above estimate is based upon buying supplies and only hiring labour during planting and harvest time, six men, one from each family, working all the time.

EARNINGS.	Amount Dollars.
900 acres planted in rice, yielding 45 bushels of 45 lbs. each rough rice, per acre, sold, at 85 c. per bushel	34,425
Less annual expenses	13,650
Net income ...	20,775

Dividing up the investment among six farmers, each farmer would pay 5,416 dol. 66 c., and would own 166⅔ acres of land, one-sixth of machinery, one-sixth of the canals, fencing and levees, one house, stable and well, four mules, one set of implements.

	Amount. Dol. c.
The share of each farmer in the gross earnings would be ...	5,737 50
His share of annual expenses ...	2,275 0
Leaving net profit ...	3,462 50

Estimated cost of planting, irrigating and harvesting 900 acres of rice in Texas by contract:—

	Per Acre		Amount.	Total.	
	Dol.	c.	Dollars.	Dol.	c.
Breaking the land	2	0	...	1,800	0
Ploughing ...	1	77	..	1 593	0
Discing ...	0	64½	...	580	50
Harrowing ..	0	47½	...	427	50
Drilling ..	0	37½	...	337	50
Seed ...	1	50	...	1,350	0
Total cost of planting ...	..		..	6,088	0
IRRIGATING.					
Fuel ...	...		900		
Engineer ..	...		300		
Repairs ...	...		100		
Labour ..	..		300		
				1,600	0
Harvesting ...	...		..	1,800	0
Threshing and sacks	..		..	2,000	0
Total ...	..		...	11,488	50

EXPERIMENTAL STATION.—A rice experimental station has been established by the United States Government at North Galveston. It consists of 160 acres, and is intended for a rice experimental and demonstration farm. A model up-to-date farmhouse has been built, and stables, granary and machinery buildings of the most modern design have been erected.

In addition to testing the different varieties of rice, fertilisers, methods of cultivation, &c., a considerable amount of breeding of rice is done with a view, if possible, to obtain distinctively American varieties, of recognised value for planting, and more suitable to the soil, climate and conditions in this country.

(To be Continued.)

MEDICINAL.

THE DRYING OF COCA LEAVES.

BY S. W. K. DE JONG.

(Korte Berichten, Buitenzorg, Java: Abstracted by Ed.).

Since cocaine merchants value the leaves by their content of the drug, it is important to know the best way to dry the leaf to preserve the alkaloid.

Two separate samples, (*a*) and (*b*), were dried in various ways, with results shown in the following table:—

	1.	2.	3.	4.	5.	6.	7.
(*a*)	2·75	—	2·38	2·28	—	2·13	1·52
(*b*)	2·91	2·88	2·51	—	2·16	2·05	—

1. Fresh leaf analysed.
2. Leaf dried over lime.
3. Do. in the sun for two mornings.
4. Do at 40° C (104° F.)
5. Do. at 60—75° C (140—167° F.)
6. Do. 4 days in shade and then 1½ hours in sun.
7. Do first placed in boiling water and then in sun.

From these results it is concluded that as drying over lime is impractial, drying in the sun is to be preferred. If the leaf must be artificially dried, this should be done at as low a temperature as possible.

FIBRES.

THE DANNI PALM.

Of the many remarkable palms that flourish on the tropical littoral of India and the East, few are more valuable or generally interesting than the graceful feathery leaved *Nipa fruticans.* This species instals itself on the soft, dark, slimy mud of marshy land in the vicinity of the sea, which is subject to the direct play of the tides. The mean elevation of the major portion of the land on which it is most at home is well below the marks of high water; while in many of the localities of its installation the tips alone of its leaves are visible above the swirling eddies of the flood. On the margins of the estuaries of sluggish rivers where the deposit of slit is so soft and treacherous as to scarcely afford foot-hold to man, and fringing the borders of tortuous tidal creeks upwards as far as the tides are felt, the Nipa palm, with its pert light-green fronds that seem to shoot up from the ooze itself, takes complete possession of the soil. Along the coasts of Burmah and the Malay Peninsula and on the shores of the islands which lie scattered beyond them, wherever sufficient protection from the violence of wind and wave is afforded a locality to admit of the undisturbed deposition of silt upon it, patches of the species, pure or mixed, from forest near the sea. The Nipa palm is gregarious of habit, and generally forms pure forests; it is, however, sometimes mixed when, with the exception of an occasional tangled cane-brake, its usual associates are species of the commoner Indian Mangroves, Rhizophora, Bruguiera, Avicennia, Ceriops, a scaly-stemmed, pinnate-leaved ornamental Date palm, *Phoenix paludosa* and the *Pandanus furcotus* and other Screw pines. Unlike the majority of tropical palms the *Nipa fruticans* has no true stem; it nevertheless developes a stem of rhizomes (under ground stems) as vigorous, extensive and aggressively exclusive as any to be met with in the vegetable world. Long before the plant will have arrived at maturity, the original rhizome that had developed from the base of the fruit which gave it birth sends out branches in various directions from the nodes at the ends and upper surfaces of which rosettes and rows of bright-green fronds are successively thrown up above the ground. The secondary rhizomes, in due course, give rise to others from which, in turn, fronds spring up to meet light. Thus, in time, the land if suitable, is covered with a dense forest of the species. But for their pert habit of growth and comparative shortness of the lighter green of the somewhat stiff and close set pinnæ, Nipa fronds resemble those of the coconut palm in its acaulous stage.

When the plant attains to its fullest developments, the flowering spadices, which are closely enveloped in short, scaly, fibrous spathes, and borne at the ends of stout peduncles are, from time to time, given out at the bases of the fronds. The obovate, purple-brown, fibrous fruits which, in due course, form globose clusters are sessile, like those of the Palmyrah palm, but so crowded together as to become flattened, curved, and sharply edged. They further resemble the fruit of the Palmyra in that, when they are immature, the grey albuminous lining of the nut forms a soft and jelly-like substance which furnishes a cool, agreeable, and refreshing esculent. Besides the young fruits, the pinnae of the fronds, in the localities in which the palm is abundant, are plaited into thatch for roofing purposes. The lower ends of the mature fronds, as well as the fresh larger spathes are valuable, though neglected, sources of fibre for brush and broom-making. But the most important and valuable product of the palm is its abundant nutritious sap or toddy. In the more accessible regions of its distribution this is extracted in the following manner :—When a spadix, of which a single plant often bears three or four in the season, will have attained the limit of its elongation and begin to arch down with the weight of the expanding inflorescence, the latter is severed at its junction with the peduncle. The cut end of the peduncle is now tied round with fibre and inserted into the narrow mouth of an earthen pot. Owing to root and other internal pressure, the sap soon trickles into the pot, the contents of which are collected and stored. On account of the prevalence of the tides, the operations of tapping and collecting the toddy have to be conducted between their ebb and flow. The toddy which, when freshly drawn, is a tasteless, insipid, clear liquid, turns, by keeping, into a turbid intoxicant of acid bitter taste. At all times it is more liquescent than the similar product obtained from the coconut, palmyrah, or cargota palm. The toddy is either consumed as such, or it is distilled into an ardent spirit. This arrack, as it is distilled in Mergui, is characterised by a nauseating taste and acid odour, but does not, when drunk lead to the ready or complete inebriatio

caused by that obtained from any of the other Indian palms. Toddy for the manufacture of jaggery or gur is collected in pots plastered with slaked lime on the inside. The liquor, which by this means is rendered cool and sweet, is then boiled in iron pans. On becoming thick enough to just drip from the ladle with which the mess is continually stirred, it is poured into flat earthen chatties in which, on cooling, it hardens into gur.—*Indian Agriculturist*, Nov. 1, 1907.

[This palm, known as Gin-pol, occurs in rivers near Matara and elsewhere in the South-West, and might be utilised.—Ed.]

TIMBER.

TAMARINDUS INDICA. (TAMARIND.)

[*Dictionary of Economic Products.*]

Vol. VI., Pt. III. T. 28—50.

THE USES AND COMPOSITION OF TAMARIND SEEDS.

(BY DAVID HOOPER, F.C.S.)

TAMARIND SEEDS WIDELY USED AS A FAMINE FOOD.

During an enquiry conducted in 1903-04 by the Reporter on Economic Products to the Government of India on foods used in time of scarcity and famine, the seeds of the tamarind tree were submitted as articles of general consumption from no less than sixty localities. It has been known for many years that the seeds are occasionally eaten by the inhabitants, but it was left for a systematic enquiry undertaken in all parts of India to reveal the extent and importance of the use of these seeds as an article of diet. In continuation of *Agricultural Ledgers* No. 7 of 1902, Nos. 4, 5 and 6 of 1904, and No, 2 of 1906, and preparatory to the publication of a complete list of Indian Famine foods, the present Ledger deals with the description and composition, in this connection, of the abovenamed seeds. The tamarind is one of the most beautiful of the common trees of India, and is frequently planted in avenues and topes. It flowers profusely in April and May; and the fruit ripens in the ensuing cold weather. A large tree yields five or six maunds (411$\frac{3}{7}$—493$\frac{5}{7}$ lbs.) of fruit. This is largely consumed, being a favourite ingredient in curries and chutnies and sauces, and is exported in bulk for medicinal purposes as East Indian tamarinds. The fruit is a large flat pod, from four to six inches in length, filled with acid pulp, seeds and stringy fibrous matter. As sold in the bazaar, the fruits contain, in one hundred parts, the following proportions of pulp, seeds and fibre :—

Pulp	55
Seeds	33·9
Shell and fibre	11·1

DESCRIPTION OF SEED.

It is thus evident that whenever the pulp is prepared for culinary purposes a large quantity of seed is removed, and in many of the town residences it is rejected as useless. The following is a description of the seeds taken from the "Pharmacographia":— "The seeds are flattened and of irregular outline, being round, ovate or obtusely four-sided and about 6-10ths of an inch long by 3-10ths thick, with the edge broadly keeled or more often slightly furrowed. The testa is of a rich brown, marked on the flat sides of the seed by a large scar or areole of rather duller polish than the surrounding portion which is somewhat radially striated. The seed is exalbuminous with thick, hard cotyledons, a short straight included radicle and a plumule in which the venation of the leaves is easily preceptible. The testa of the seed abounds in tannin, and after long boiling can be separated, leaving the cotyledons soft. The latter have a bland mucilaginous taste." One hundred seeds weigh 75·88 grams; the average weight of a seed is therefore 117 grains.

USES.

Tamarind seeds are universally eaten by the poorer people of India during times of scarcity and famine, and are occasionally eaten by others at ordinary times. The seeds have been received from the following places as a famine food.

WHERE CONSIDERED A FAMINE FOOD.

Madras :—Anantapur, North Arcot, Bellary, Bhadrachalum, Chinleput, Coimbatore, Cuddalore, Cuddapah, Ganjam, Godavari, Kistna, Kurnool, Nilgiris, Vizagapatam, and Yellavaram. Central Provinces : Nagpur.

Central India: Bhopal, Bhopawar, Gwalior, Jhalawar, Malwa, Merwar, and Shahpur.

Bengal: Hughli, Monghyr, Manhum, Murshidbad, Ranchi, and Singbhum.

It would appear that as a food tamarind seeds are mostly consumed in the Madras Presidency and Central India. Kistna is the only place where it is reported that they are sold; the price given is six pies ($\frac{1}{2}$d) for a bag of about 20 lbs.

PREPARATION FOR CONSUMPTION.

They are in great demand for the fruits by the Telegus of the Godavari district, and for this reason the tree is very valuable. For edible purposes they are first roasted or soaked and boiled in water to remove the outer skin. After soaking in water, the brown skin is easily removed as in the blanching of almonds; and the white kernel is tolerably palatable. The kernels are dried in the sun, or roasted over fire, and ground into flour. This flour may be at once made into cakes or chupattis, but when other cereal flour is available they are mixed in some suitable proportion before being baked into bread. In Ranchi the seeds and rice are fried and powdered and made into balls and eaten by the poorer

classes. The Sonthals combine these seeds with mahwa flowers in their dietary.

STATED INJURIOUS EFFECT, POSSIBLY DUE TO HUSK.

It has been reported from some districts that tamarind seeds used alone produce untoward effects. For instance, it is said that in Bhopal they produce depressing effects. In Anantapur and Cuddapah they cause constipation; in Bellary, North Arcot. diarrhœa; and Jhalawar, inflamation. There is no doubt that if the husks are not entirely removed they are liable to cause irritation from the astringent and fibrous matter they contain, but, as will be seen from the analysis of the almonds themselves, they are comparatively nutritious and free from mechanically disagreeable ingredients.

MEDICINAL USES.

The seeds in some districts are regarded as medicinal. They are powdered and given for rheumatism in the Hindu system of medicine, and are administered for herpes according to the Yunani system. Some people regard the seed as stomachic. According to Wight a paste made of the seeds simply smeared on the skin has the property of promoting suppuration in indolent ulcers. They are also said to form a convenient poultice for boils. The powdered seeds boiled in a small quantity of water make a tenacious glue or size used by wool-weavers, saddlers and book-binders. This is used to dress country-made blankets. According to Nesbit, in Burma, silk thread is dyed red on being dipped into boiling water into which the seeds have been thrown. Finally the seeds boiled to a glue are said to form a strong wood cement.

COMPOSITION.

Analysis was made of the entire seeds, and also of the kernel without the brown covering. They had the following composition:—

	Seeds.	Kernels.
Water	10·50	9·35
Albuminoids ...	13·87	18.06
Fat	4·50	6·60
Carbohydrates ...	63·22	62·88
Fibre	5·36	·66
Ash	2·55	2·45
	100·00	100·00
Nitrogen ...	2·00	2·89
Phosphoric ...	·40	55

There is a decided difference in the composition of the shelled and the unshelled seeds. The shells contain the undesirable constituents, namely, the tanin matter and fibre, and the kernels represent a nutritious food, white in appearance and with no disagreeable odour and taste.

OIL: ONLY PRESENT IN SMALL QUANTITIES.

A statement appeared fifty years ago in the Journal of the Agri-Horticultural Society of India (Vol. IX., 1857,1366), that a certain Captain Davis in experimenting with some jungle seeds pressed some seeds of the common Indian tamarind and obtained an oil of a fine amber colour which he thought would prove a substitute for olive oil. The odour of linseed oil was attributed to the mill having previously been used for the extraction of linseed oil. The oil was favourably reported upon by Babu Ramgopal Ghose.

These statements were repeated in Exhibition Catalogues and standard works in oils, as that of Brandt, who states that the seeds contain 20 per cent. of oil of a thickly fluid nature. Another writer expresses regret that the oil has escaped the attention of natives. But no blame is attached to the natives of this country. Tamarind seeds are not oil seeds. It was pointed out in "Pharmacographia Indica," 1890, that the dry seeds yield no oil by expression, and by solvents the yield was only 3·9 per cent. In the above analyses the seeds are shown to yield 4·5 per cent., and the kernels 6·6 per cent. of oil, a portion not much above that found in the pulses.

NATURE OF OIL.

The oil obtained by ether is thick and light yellow in colour. It solidifies at 15° C., and gave the following constants:—

Acid value	0·84
Saponification value ...	18·33°
Iodine value	87·1
Fatty acids	94·9
Melting point of ...	46°

The fatty acids crystallised twice from alcohol afforded an acid melting at 74·5°, resembling arachidic acid of ground nut.

Elaidin reaction gives a buttery consistence. The oil is semi-drying, forming a skin only after 12 days.—*Agricultural Ledger*, 1907, No. 2.

MISCELLANEOUS

SIR HENRY BLAKE ON NATIVE AGRICULTURE AND THE CEYLON AGRICULTURAL SOCIETY.

(*Extract from Paper read before the Royal Colonial Institute.*)

But in considering the future welfare of the people, the present needs should not be neglected; and, while the population is on the whole as contented as any community known to my experience, and as law-abiding in its attitude towards the Government, it is evident that their material prosperity may be greatly enhanced if they can be induced to improve upon their present system of agriculture, and to adopt better arrangements for the disposal of their produce. It would be impossible in the time at our disposal to go into the question of land tenure. Suffice it to say that it is varied and complicated, as customs that in bygone times could be dealt with by the arbitrary will of the king, and difficulties settled by a word, have been accepted and legitimised by the British Government in the Ordinance 12 of 1840, by which for the first time definite and inalienable rights of property were conferred upon all owners then in possession.

The Ceylon Agricultural Society

was formed by me in November, 1904, after I had visited the greater portion of the island. Its object was to bring all classes down to the smallest cultivators into closer touch with the Government, with each other, and with the scientific staff of the Botanic Department, for, if any improvement was to be hoped for, science must go hand in hand with labour. The central society was formed of all the members of the Legislature, some of the principal inhabitants, European and native, of each province, and all the members of the staff of the Botanic Department. Local societies were formed by voluntary action in every part of the island, and were affiliated to the Central Board of Agriculture. They receive all the publications of the Society, and every information that can be of use to cultivators is sent out in thousands of leaflets in Sinhalese and Tamil to the local societies. Every member pays a subscription, and the feeling of self-respect is preserved. Instructors are appointed by the Central Board, who, on invitation, are prepared to attend any meeting of local societies, and give practical instruction upon any matter under consideration, and the staff of the Botanic Department, who from the first have placed their services unreservedly at the disposal of the Society, answer readily any questions submitted to them, and of themselves issue valuable advice that strikes the director, the chemist, the mycologist, or the entomologist as being of service on the general question, or in the event of the occcurrence of a pest or disease. The result has been quite equal to my expectations. I will not say beyond them, for my experience has shown me that, if the people believe that there is a *bona fide* anxiety to assist them, they will respond. In May, 1907, the latest date for which I have statistics, there were 1,200 members of the Central Society, and fifty-two local branches had been established with an aggregate membership of 4,000. Numbers of native gentlemen came forward, some giving considerable sums, others sufficient areas of land for experimental stations, and experiments were in progress that cover the entire ground of rotation in paddy fields; and on high ground, the introduction of new products, such as date palms, sisal hemp, salt bush for fodder, Australian and American maize, &c., and the improvement of paddy by the introduction of the best new varieties, of cotton, of tobacco, of arrowroot, of cassava, and other numerous products hitherto neglected. Experiments are also being made in widely separated districts of the effects of artificial manures generously supplied free by Messrs. Freudenberg & Co., of Colombo. Sericulture and apiculture are also receiving attention, and results in all these matters are brought before the people by agricultural shows organised by the local societies, with the co-operation of the Central Board, the judges being supplied generally from the staff of the Botanic Department, and pains being taken that prizes are only given to the actual growers of the exhibits. In these shows the people take a deep interest, and the competition is very keen. Co-operation has made considerable strides, and I look forward to a great extension of the principle. The Central Board of Agriculture has made arrangements for the receipt in Colombo of consignments of cattle, agricultural produce, or fruit from local societies, and for their sale by auction or in the markets, and this arrangement has worked well. In two or three districts Co-operative Loan Societies have been formed with entirely satisfactory results. In this direction I have been urged from time to time to establish Government Loan Banks, but I have refused, for I am satisfied that any practical success

in the agricultural movement must be secured by insisting upon the principle of self-help. If you want to ruin a man, body and spirit—to take the spring from his muscles and the stimulus of necessity from his mind—give him something for nothing. A Co-operative Loan Bank is creative, a Government Loan Bank is an object for predatory attack. The one stimulates prevision, industry and sense of responsibility, the other induces extravagance and carelessness; for it may be broadly asserted that no Eastern peasantry, probably no peasantry, would regard a Government loan in the same light as an advance made by his neighbours and co-partners, who will have no nonsense in the matter of repayment. The Agricultural Society is being

WORKED WITHOUT EXPENSE TO THE PUBLIC REVENUE

save the modest grant of £2,000 made annually to it. I regard it as one of the most hopeful factors in the future progress of Ceylon.

LITERATURE OF ECONOMIC BOTANY AND AGRICULTURE.

BY J. C. WILLIS.

Pomegranate.—Pomegranate. Jamaica Bull. 1900, p. 106.
Ewers on alkaloids of bark. Just's Jahresb. 27, 1899, II, p. 19.

Potato.—Potato diseases of India. Agr. Ledger Pest Series.
The preparation and use of dried potato. Imp. Inst. Bull. I. 2, p. 77, 1903.
Degeneration in potatoes. Kew Bull. 1907.

Prickly Pear.—The uses of the prickly pear. Ind. Gard. 24 May, 1900, p. 340.
Analyses of prickly pear. Agr. Gaz. N. S. W. XI. 1900, p. 671.
The use of prickly pear as fodder. Bull. 4 Centr. Agr. Comm. Madras.

Psophocarpus.—Goa beans in India. Agr. Ledger. V, P. Series 96, 1906.
Manila bean in Jamaica. Jam. Bull. May 1907 p. 89.
Psophocarpus tetragonolobus. "*T.A.*" Aug. 1907, p. 132.

Pterocarpus.—*P. tinctorius* Welw. Tropenpfl. July 1899, p. 340.
P. Marsupium. Agr. Ledger Med. Series, 15.

Pulses.—The Cultivation of pulses in the Assam valley, Agr. Ledger V. P. Series, 74.

Quillaja.—Quillaja and its uses. Ind. Gard. Jan. 1904, p. 11.

Rafia.—Rafia fibre in Madagascar. "*T.A.*" July 1901, p. 59.
Rafia fibre in Madagascar, Ind. Agri. May, 1904.
Der helle und der dunkle Rafia-bast von Madagaskar. Sadebeck. Engl. Bot. Jb. 26, p. 369.
Raffiavezel. Ind. Merc. Dec., 1905, p. 896.
Le Rafia. Bull. Jard. Col. 1905.
Die Raphiapalmen und ihre Verwendung. Der Pflanzer. Aug. 1907, p. 161.

Rattan.—Rattan industry of Rheims. Kew Bull. 1899, p. 200.
Rotan. Preyer in Tropenpflanzer, 6, 1902, p. 12.
Rattans. Ridley in Str. Bull. II. 1903, p. 129, 157.

Rauwolfia.—*R. serpentina.* Benth. Ind. Merc. June 1900, p. 383.

RECENT ARTICLES IN THE LITERATURE.

Under this head we propose to give from time to time the titles and places of articles in the literature of Economic Botany that have lately appeared. Anyone interested can consult these in the library at Peradeniya.—ED.

The tuna as food for man.—U.S. Dept. Agr. Bureau Plant Industry, Bull. 116. 1907.

Note sur le Haricot de Birmanie. (Psophocarpus tetragonolobus)—Bull. Jard. Colon. 7, 1907, p. 429.

Tobacco growing in the Philippines.—Bureau of Agric. Manila, Farmer's Bull. 15. 1907.

Jute experiments, in Bengal.—Indian Agriculturist XXXIII, Dec. 1901 p. 359.

INDIAN AGRICULTURE.

BY HENRY STAVELEY LAWRENCE, I.C.S., Director of Agriculture, Bombay.

[Paper read before the Indian Section of the Society of Arts on Thursday, January 16th, 1908.]

There is scarcely any subject, even in the wide field that India presents for controversial treatment, on which you will find so much divergency of opinion and such extreme contradiction of statement as on the subject of Indian Agriculture. The excellent Mountstuart Elphinstone, in the standard history which he published some seventy years ago, wrote :—"The nature of the soil and climate makes agriculture a simple art,"

and this view is still upheld by those authorities who maintain that the Indian peasant knows all that is worth knowing about the capabilities of his soil and the cultivation of the crops suited thereto.

On the other hand, competent scientific observers lay stress upon the complex and difficult conditions of agriculture in India, point to the wonderful improvements which Western science has affected in Europe and America within the last century, and assert confidently that the same principles, when applied to India, will promote the efficiency of agriculture in a remarkable degree. This school would have us believe that their antagonists, eminent though they may be in all other branches of human knowledge and practical administration, yet have an insufficient acquaintance with the history of agriculture and of the progress of science.

In every country the position of agriculture is closely connected with the economic history of the people. It would clearly be impossible to place before you within the narrow limits of an hour's lecture, a comprehensive account of the vast range of subjects which invite discussion; and I am compelled not only to confine myself to a few of the more salient aspects, but to treat even these with a wide generality of statement. I have drawn my illustrations chiefly from Western India, to which my personal experience extends, and since India is a continent, every statement must be taken as subject to numerous exceptions.

INFLUENCE OF CASTE.

The assumption that agriculture in India is a stationary art, stereotyped in the mould in which it was cast thousands of years ago, is a common misapprehension. It is no doubt true that in early days changes took place slowly. If the system established under the laws of Manu—whereby all society was divided into four sections, the Brahman (priests), the Kshatriya (warriors), the Vaisya (traders and agriculturists), and the Sudra (menials)—secured the tradition from father to son of the specialised knowledge of agriculture in a distinct caste, and represented an advance on the primitive methods of nomad barbarism, it nevertheless tended, at a time when education was confined to Brahmans, to prevent the communication of ideas, and the transference of agricultural improvements from one tract to another. Everything in India has its roots so deep down in the past that this old-world system exercises a potent influence on the conduct of the people at the present day. When we find the great landlords of the Brahman and soldier castes holding themselves aloof from the practical administration of their estates, we are reminded that agriculture is scarcely mentioned in the voluminous records of the sacred books which prescribe the daily duties of Brahmans and warriors in minute detail. In certain tracts, indeed, the belief is current that orthodox Brahmans are not permitted to engage in agriculture. Fortunately, these prejudices are not of universal application, and are waning; and where, as in parts of Western India, the Brahmans were compelled by the increase of their numbers to undertake secularised occupations, they brought agriculture to a very high pitch of perfection.

This interesting fact deserves a moment's digression in view of the criticisms that are sometimes heard of the inefficiency of the Brahman as a man of business, and the futility of seeking his aid in the improvement of agriculture. It may be admitted that the Brahman will not turn to practical work in the field or laboratory except under the pressure of severe compulsion; for he is not only as tenacious of his claims to a free maintenance by the community as the high-born classes of Western Europe, but also honestly reluctant to abandon the doctrines of his religion, which forbid the acquisition of wealth and enjoin abstinence and meditation in his closing years. The law of self-preservation, however, has never appealed to the Brahman in vain. The intellectual pliancy which enabled him to incorporate animistic beliefs in his philosophy, and to undermine the popularity of Buddhism, will not fail him in the present crisis.

There are evident signs that he recognises the overpowering constraint of the Material Age in which his lot has been thrown—that Kali Yuga—when "the usages and institutes of caste, of order and of rank, will not prevail, nor yet the precepts of the triple Veda." As a hundred years ago Brahman soldiers took a conspicuous share in the conquest of India for the East India Company, so now Brahman students are preparing to play their part in the industrial and agricultural awakening of India.

To return to the cultivator: the rigid distinction of castes, and the absence of guidance or control by the superior landlords have been the underlying causes of the variations in agricultural skill and the irregularity of progress exhibited in homogeneous tracts throughout the country. But early records, if scanty, suffice to show that in

spite of all obstacles, important changes did take place; and in proportion as India has been brought more and more closely within the influence of the forces that are binding the world together in an universal community of commerce, the rapidity of these changes has been greatly intensified.

ANCIENT AGRICULTURE.

Agriculture did not bulk largely in the earliest historical account of the trade of India, for we read that the Phœnician pilots of the fleets of King Solomon brought, from India, gold and silver, ivory, apes, and peacocks. To the Romans, India furnished diamonds and pearls, silk, and spices, such as frankincense, cassia, and cinnamon for funeral ceremonies and the worship of the gods. In the Arab and Mogul period, cotton and sugarcane had come to the front; three hundred years ago, pepper, spices and indigo aroused the rivalry of the Dutch, Portuguese and English mercantile companies. A century ago, the exports of the East India Company comprised cotton, silk, wool, gum, spices, indigo, and coffee, and were valued by them at £2½ million sterling.

Last year the exports amounted to £105 millions, of which jute and tea—two new products discovered in the course of last century—accounted for £20 millions and £6 millions respectively; and other chief items were cotton £24 millions, rice £12 millions, wheat £6 millions.

To the general rule that Hindu Governments paid little attention to agriculture, one important exception must be made. In Southern India irrigation was fostered by the remarkable system of tanks or reservoirs for the storage of water, and by the construction of anicuts in the deltas of the Madras rivers. In the dearth of historical memorials of Hindu rulers, the origin of these works has been forgotten; but the river canals can only have been undertaken by rich and powerful princes, while the storage reservoirs were probably created by village communities or wealthy critizens as acts of charity. In former days it was the custom for the local banker to ease his conscience, and seek the blessings of posterity by lavish expenditure on the provision of water and shade for the benefit of his village. With the modern assumption by the State of responsibility for these objects, and the new sense of security for the transmission of property by inheritance, this custom has fallen into abeyance. The motive, however, which inspired these benevolences, whether we call it public spirit or private charity, is not dead, and if it could be brought forth once more into active operation, its effect on the promotion of agriculture would be incalculable.

MOHAMMEDAN PERIOD.

Let us now turn to the period of the Mohammedan domination from the twelfth to the seventeenth centuries.

The Moslem invaders, sweeping over many countries, showed a genuine appreciation of the good things in each, and carried out a most useful interchange of methods and products. From the Euphrates and the Tigris they introduced into northern India and the Deccan the system of irrigation canals. Wherever they went, they either imported or improved the cotton-plant and the sugarcane. In considering the claims of the Mogul Emperors to fame, we are apt to regard exclusively their military and administrative achievements, the splendour of their court, and the magnificence of their architecture; and to overlook the credit they deserve for their intelligent patronage of agriculture and irrigation. But the great Baber—the contemporary of our Henry VIII.—in his fascinating autobiography tells us himself of the interest he took in the transference of sugar-cane from one tract to another, and in the cultivation of fruit orchards; Jehangir again, in his memoirs, makes a special mention of the introduction of tobacco, although in terms of disapproval; and from the records of Akbar we learn of the importation from Persia of agricultural experts. It is common knowledge that the English administration is closely modelled on the Mogul prototype, but it is interesting to find a precedent for the latest creation of English genius, the Department of Agriculture; and it is even possible that, if success is to be attained in the experiments now in progress for the cultivation in Sind and the Western Punjab of Persian dates, we may have to send to Persia for the lineal descendants of Akbar's scientific gardeners.

It is wholly unnecessary for me to remind you of the royal encouragement to agriculture in this country, but in India his gracious Majesty's example does not as yet find many imitators. In Hindu States the ethics of rule do not inculcate this duty, and in Mohammedan States the teaching of the Koran, that agriculture is of divine origin, receives scanty recognition. It is true that, when his Majesty as Prince of Wales founded the Imperial Institute for the development of agriculture throughout the Empire, liberal donations were obtained from India, but we hear little in India

of the practical interest and sympathy of native rulers such as is manifested by his Majesty in his constant attendance at, and participation in, agricultural shows, and his patronage of such enterprises as the British Cotton Growing Association.

Cotton.

From the earliest ages cotton has been one of the chief products of India, and some account of its history will not be inappropriate here. We need not go back further than the time of Alexander the Great whose admiral, Nearchus, wrote of the "fleeces that grow on the trees in India," and we know now from the researches of Sir G. Watt and other eminent scientists how accurate his description was, for in those days cotton was grown not as an annual plant but as a perennial tree. There is little doubt also that the outturn of these fleeces was exceedingly scanty, and was held in very high estimation. Thus, in China a cotton robe was one of the most valued possessions of the Emperor, and in India the Brahmans selected cotton to form the sacred cord of their caste, while they allotted hemp to the soldier and wool to the trader. To this day the sacred cord of the orthodox Brahman is taken from the Dev Kapas tree, the Holy Cotton tree, which is grown as a perennial in gardens.

It is probable that it was during the Mohammedan period that the most important discovery was made that the cultivation of cotton as an annual plant rendered it possible to obtain a far larger crop of lint, to refresh the soil by rotations, and to preserve the tree against the insect pests to which it is peculiarly liable.

The Mohammedans also carried the knowledge of cotton cultivation from India to the Mediterranean and to Spain; and it was from the Levant that the first supplies of cotton came to make Manchester the emporium of the cotton trade in the early days of the Stuarts.

At the same time the cultivation of the plant was begun in the United States from seed obtained both from the Levant and from the West Indies, though 150 years were to elapse before the States seriously set themselves to export cotton to England. As soon as the East India Company found themselves free from the danger of annihilation in the wars of the eighteenth century, they turned their attention to the improvement of the cotton trade. In 1788 consignments of superior seed were imported and distributed throughout the peninsula; and steps were taken to compress and pack the cotton in bales. A few years later bounties were offered for improved samples of cotton. In 1813 the first American cotton expert was despatched to India, and took with him a number of New Orleans saw-gins. In 1816 the export of cotton was encouraged by exemption from all the internal and export duties then levied on the transport of produce in and from India. Tariff reformers are, no doubt, aware that between 1803 and 1831 preferential rates of import duty were levied in England, which in the latter year represented 4d. per cwt. on cotton from British possessions, and 5s. 10d. on foreign cotton.

Between 1816 and 1840 various measures were taken; bounties were given for certain qualities of cotton; seed was introduced from all parts of the world, and attempts were made to improve the native methods of cleaning the cotton.

In 1840, ten American planters were brought to India, and were placed in charge of experimental farms in all the three Presidencies. Their experiments were extended over a period of ten years, but it was found impossible to acclimatise American cotton to Indian conditions except in a small corner of the Dharwar district in Bombay.

After the cotton famine of the American Civil War many of these measures were repeated, but once more without success.

Economic Progress.

This summary may serve to show that the cotton problem is not so easy of solution as enthusiasts at home are inclined to imagine, and that the Government of India are not open to the reproach sometimes levelled at them of indifference to the cotton interest. A long course of disappointing failures led, by painful steps, to the adoption of a sound policy of economic progress. It was at length realised that the first need of the country was facility of transport, and the provision of organised agricultural enquiry based on the co-operation of the people. In the first half of the last century there was no co-ordination in the experiments made in different regions; it is true that success was attained with such products as tea, indigo, and coffee, which offered a favourable field for European enterprise in suitable climatic conditions, but Government possessed no skilled agricultural advisers to investigate and advance the cultivation of the staple crops. Sometimes, as in the case of cotton, the measures adopted met with active opposition

from the people, who saw no advantage in growing the superior quality of lint. The cotton exports of those days were barely five per cent. of the total produce, and the inferior fibre not only was suitable for the internal consumption of India, but commanded an equal price, and was more secure in out-turn. Whatever the reasons may have been, it was reported that in many places the native capitalists employed men to go out at night and root up the American seedlings in the experimental farms.

Up to 1850 the East India Company had paid little attention to roads, canals, or other public works. The Court of Directors stated that their average annual expenditure on all public works in India was about a quarter of a million sterling. An urgent demand sprang up for the construction of roads and railways. The railway mania in England was at its height, and the English commercial community raged with indignation against the apathy of the Indian Government. Those critics who complain now of the insufficiency of an annual Budget of £10,000,000 for the extension and equipment of railways would find consolation and support in reading the remarks of their predecessors, when it took fifteen years of negotiation to build the first fifteen miles of railway from Bombay to Thana.

The famines that occurred then were as terrible in their results as those that preceded the establishment of British rule. In a petition presented to the House of Lords in 1853, we read:

"Famines occur decennially, some of which, within our time, have swept their millions away. . . . The living preyed upon the dead; mothers devoured their children, and the human imagination could scarcely picture the scenes of horror that pervaded the land. In twenty months' time 1,500,000 people must have died of hunger or of its immediate consequences. The direct pecuniary loss occasioned to Government by this single visitation exceeded £5,000,000 sterling, a sum which would have gone far to avert the calamity had it been expended in constructing thoroughfares to connect the interior with the sea coast, or districts where scarcity prevailed with those where human food was to be had in abundance."

The strong arm of the English administration has within the space of half a century banished these horrors into the abyss of oblivion, but it is well for us occasionally to reflect on the methods by which this humanitarian resolution has been accomplished and the fundamental conditions of its maintenance.

During this period of unbroken internal peace, the energies of the Government have been devoted to the prosecution of railways, roads, irrigation canals, and education—the four requisites which are equally essential to preservation from famine and the economic and agricultural development of the country.

At a cost of some £250 million sterling, over 30,000 miles of railway have been constructed, of which two-thirds are the property of the State; metalled roads cover 37,000 miles, and unmetalled roads some 140,000 miles, and the annual expenditure on their extension and upkeep approximates £3,000,000. In irrigation works, the capital expenditure up to date amounts to £30,000,000, and 43,000 miles of canals and distributaries irrigate an area of 16 million acres. Incidentally, I may observe that the State assets in the form of railways and canals represent three-fourths of the whole public debt of the country.

The policy thus steadily pursued has transformed the agricultural economy of whole provinces. I will mention a few instances only. When visitations of famine occur now, the people are spared the ultimate calamity of the absence of supplies of food. The network of adjacent railways brings an ample provision of grain into the afflicted area; when all hope of a harvest is at an end, and the labourer and small peasant can no longer find employment in the barren fields, they are secure of subsistence by labouring on the relief works organised by the State. Let me illustrate the result of this change. In the famine of 1876-77 a corner of the district of Bijapur was cut off from the railway by 150 miles of difficult country; grain was scarcely obtainable, the people fled in all directions, and out of an area of 360,000 acres 60,000 acres were utterly abandoned in the following years, the owners either having died or having been reduced to the class of landless labourers. Thirty years later, when a railway traversed this district, the same tract was smitten by an equally severe drought, but not a single acre fell out of occupation. No impediment to agriculture was comparable to the devastation caused by famine when villages were deserted and fields lay waste and untilled; and the protection conferred on the cultivator by the railway was the first step to the improvement of agriculture.

It is difficult for us now to imagine the days when the greater part of British India possessed no roads that would allow of the employment of carts; yet such was the case fifty years ago, when

except where navigable rivers provided a waterway, the whole merchandise of India was conveyed on pack-bullocks, or baggage-camels. Let us consider the cotton of Berar and the Central Provinces. Bullocks carrying loads of a couple of hundredweight of cotton, used to march the whole of the four hundred miles to Bombay through districts where the animals suffered from drought, and through hills where robbers pillaged the cotton. We can realise that the cultivator did not grow rich on his share of the price finally obtained. Even after the American war had raised the price over two shillings to the pound, the exports of these provinces amounted only to 270,000 bales, while in 1905, with a price of 4¼d. per lb., the exports had increased by 900,000 bales, and the cultivation by 3,000,000 acres. Of changes in the methods of production no record is available, but the statistics show that an acre of cotton represented an export of 60 lbs. of lint in 1866 and of 100 lbs. in 1905, and, however little reliance we may be disposed to place in statistics there are clear indications that a great advance in agricultural efficiency coincided with the development due to the construction of roads and railways.

To the results of irrigation I will refer later on, but here, as an instance of an important change, I would quote the production of wheat on areas which have been reclaimed from the desert in the Punjab and Sind. Ten years ago India was not recognised as a source of supply for wheat for Europe; three years ago she exported over 2,000,000 tons, almost wholly the produce of the irrigation canals, and furnished this country with a quarter of her total provision of wheat.

CO-OPERATIVE CREDIT SOCIETIES IN BENGAL.

In the opinion of the Lieutenant-Governor, as expressed in the Resolution recently published, Co-operative Credit Societies in Bengal have reached a stage in which it is necessary to make arrangements for their future organisation. This conclusion does not imply that the movement has as yet attained large proportions. The fact is that "in the past three years nothing more than a commencement has been made." Out of a population of 55 millions less than 15,000 families are even now associated with these beneficent institutions. But the Societies are multiplying to such an extent as to make it evident that the Registrar will no longer be able to exercise personal control over all of them. It may be asked why an additional Registrar should not be appointed. Doubtless this step will be taken if necessary, but the very essence of the Co-operative Society movement is that official control should be reduced to the narrowest limit. Most of the Bengal Societies are modelled upon those founded by Raiffeisen and Schulze Delitzsch, the German reformers, who by means of co-operation rescued thousands of the artisans and the peasants of their country from the toils of the usurer. It is of little avail to introduce into Bengal the organisation devised by these men unless the spirit of their systems is also in some measure present. Now, though Raiffeisen and Schulze Delitzsch differed in some respects, they were agreed in repudiating State intervention and in rejecting State aid. The truth is that help given by the Government to those whose chief need is to learn how to help themselves is injurious and even demoralising. Unfortunately in this country the Government were compelled to start the movement because India had produced no Raiffeisen or Schulze Delitzsch willing to devote himself to the deliverance of the ryot from the money-lender. The lack of such men is still felt. "The great want," writes Sir Andrew Fraser, "is local organisers,—men resident in the districts, with an intimate knowledge of, and sympathy with, the people, who are themselves firm believers in the principles of co-operative credit. At present three such men have come forward, but at least one local organiser is needed in every district." It is not easy to understand why Bengal should have produced only three men willing to serve their country in this way. It possesses patriotism enough and to spare, and we have frequently heard that it is the duty of the patriot in these days to desist from talking and to work. Here is an opportunity of increasing enormously the prosperity of the country, not by adding to the wealth of a few, but by assisting every ryot to escape from the clutches of the usurer and to acquire a modest independence. Yet three men only have come forward to help. Such a condition of things seems almost inexplicable. Possibly the part taken by Government in starting the Societies has given the impression that they are State institutions, and unhappily there are many who will hold aloof from any enterprise which bears the official stamp. But it must be abundantly clear by this time that the Government are genuinely anxious to avoid all needless interference with this movement and to leave the people to their own devices. Sir Andrew Fraser's resolution gives fresh proof of

the sincerity and thoroughness of this desire. In discussing the work of an organiser he says:—"It is essential that its character should be non-official as far as possible. Formal inspections made with the object of detecting petty mistakes in the accounts are not wanted. Such inspections would do harm rather than good." The note of sincerity is manifest here, for if there is one thing dearer to the official soul than any other, it is the detection of "petty mistakes in the accounts." Another indication of the wish of the Government to respect the independence of these Societies is to be found in their finances. The report of the Registrar shows that only 26 per cent. of the capital of the Societies comes from Government sources, the rest being derived from zemindars, from investors, and from the locality. Institutions which obtain three-fourths of their capital without Government help are surely not to be banned as official proteges, especially as the State would offer no opposition if its small share in the undertaking were to be paid off. We can only hope that, as the real character of the Societies becomes better known, Raiffeisens may be forthcoming by the score in rural Bengal. Failing a supply of suitable organisers, Sir Andrew Fraser's suggestion of grouping village societies in District Unions may supply the necessary control over individual Societies. But the Co-operative Society should be strictly local, and it would be a great pity if this characteristic were marred by lack of public spirit among those competent to help.

II.

At first sight nothing could be more improbable than that Co-operative Credit Societies would prove successful in India, for, though the ryots are accustomed to a good deal of common action in the regulation of village life, they have not the reputation of reposing much trust in one another. But the unlikely has happened, and from Eastern-Bengal, as from other provinces, there come glowing accounts of the very promising character of this new movement. In fact one is almost led to fear that the official view of the nascent institutions is somewhat too optimistic and to urge the need of a more cautious estimate of their success. One cannot but remember that at one time it was hoped that Co-operative Societies would work the economic salvation of the English labouring classes. But though the Co-operative movement in England has grown to great dimensions and has undoubtedly contributed largely towards making provident men more prosperous and independent, it has not yet abolished the middle-man and his profit. The difficulties which Co-operative Societies in India have to overcome are still greater. To one of these obstacles the Lieutenant-Governor of Eastern-Bengal draws attention in the Resolution on the subject, when he says that it cannot yet be predicted in all cases how far the Societies "will be able to withstand the determined opposition, evident through the report, which is being offered to them by that class of money-lenders who have for many years kept the cultivating classes in their clutches by a system of loans which for ever preclude any chance of repayment." The position of the bannia is one which is hard to assail. Extortionate as his exactions are, he has, unhappily, for a long period been absolutely essential to the villager, acting, in short, as a kind of minor Providence who charges highly for his services. In hundreds of villages the ryot could not maintain himself until the harvest without the assistance of the bannia, and to get his daily food he is content to see himself becoming more and more involved in debt until his land, if he has any, passes out of his hands and he is reduced to the level of a labourer. The bannia is not likely to surrender without a hard fight the profitable profession which he carries on, and it is obvious that in the precarious position of the ryot and his existing indebtedness he has the means of applying almost irresistible pressure. Strange to say, however, though he has been to some extent successful in preventing the formation of Co-operative Societies, he has not contrived to break up any already formed. "The usual tactics to break the Societies have been employed," observes the Lieutenant-Governor, "and mony-lenders have refused to lend to the members in times of hardship, but in spite of this they have stood their ground, and, except in two cases, have worked at a profit." This is one of the most satisfactory features of the Resolution. Apparently it is to be explained by admirable qualities which the ryot reveals in the new experiment. He is learning to trust his neighbour, while at the same time he is evincing a business-like caution which leads him to take prompt measures against defaulters. That the Societies are well managed is shown by their financial result. They have not all been able to pay a dividend of 15 per cent. like the Shillong Society, but, as already indicated, all have worked at a profit with the exception of two which, through some misapprehension, made no use of their capital for a large part of the year. The movement is, of course, at present in its infancy.

The total membership of the Societies, rural and urban, in Eastern-Bengal is only 3,451, a number which bears but a small proportion to a population of thirty millions. But the growth of a few years has been remarkable and the movement would seem to be on the right lines. There is a refreshing absence of official interference; indeed, the Registrar of the Societies is disposed to complain that they have been little inspected by District Officers. The Lieutenant-Governor is, however, quite justified in pointing out that what seems a want of interest is really a proof of wise consideration for the welfare of the institutions. If they are to have a healthy development they must be conducted for the people by the people. Official inteference, with its repression of originality and its stamp of patronage would kill all the vitality of the Societies, while its place is now being taken to great advantage by the active assistance, in personal service and in money, of enlightened zemindars, Hindu ladies, and philanthropic Mohammedans. If the movement continues to spread and thrive the Indian peasant can have no better friend, for debt is the incubus which has hung most heavily upon him, and he will be another and happier man when, free from this thraldom to the bannia, he can secure his modest capital on reasonable terms.—*Indian Agriculturist*, Vol. XXXII, No. 12, Dec., 1907.

THE CHRISTIANA PEOPLE'S CO-OPERATIVE BANK, LIMITED.

BY THE REV. WM. T. TURNER, JAMAICA.

The introduction of People's Banks into Jamaica is due to J. T. Palache, Agricultural Instructor for the parish of Manchester, who wrote a series of articles in one of the local newspapers on the subject of Agricultural Loan Banks, dealing specially with the Raiffeisen system of rural loan banks, which was started in Germany about fifty-five years ago. He also outlined a scheme for a loan bank which, in his opinion, was suited to the conditions of Jamaica. These articles attracted a good deal of attention, and were afterwards published in pamphlet form and circulated in the island, chiefly in the parish of Manchester.

Mr. Palache followed up his articles by expounding the syetem to the various branches of the Jamaica Agricultural Society in Manchester, and advocated the adoption of these banks as an aid to the peasant class of the population. The history of the growth of this system in Germany where it originated, in other countries in Europe, in Britain, and more recently in Canada, may be said to be very remarkable, when there is taken into consideration its very small beginning, and its slow progress at the commencement. There are at present some 28,000 of these banks in Europe alone, although the third bank was not established until twenty-three years after the first one was opened. When the opposition the system aroused in some quarters, the very searching inquiries that were made by a Royal Commission, and the rapid strides the system made after the Commission had reported, are taken into consideration, the soundness of the principle on which these banks are founded cannot be questioned. The success of these banks, in every country into which they have been introduced, diverse as the conditions pertaining in these countries are, strenghtens the conviction that the system is one that should succeed in Jamaica, especially seeing, as Mr. Palache has pointed out, that the circumstances and conditions of the peasantry of the island are just such as these banks have been found most fitted to help. The people are poor, their wealth is in their labour and in the soil, and they have hitherto been handicapped by the very high rate of interest they have had to pay for the accommodation given them in the way of advances on their crops, etc. It was but to be expected that the system would be spoken against by money lenders and others. Some, too, even of those who have to depend on the people for their support, have said the system would never do in Jamaica because the people cannot be trusted. A spirit such as this is not one calculated either to help the people, or to develop the industries of a country. To the writer, it seems that a system such as this, to aid the people in their finanaces, is a necessary corollary to the efforts now being made by Agricultural Instructors and others, at no small cost of money, to teach improved methods of cultivation and to improve the character of the stock in the island. While Mr. Palache must ever get the chief credit of introducing the system of Loan Banks in Jamaica, credit is also due to the Hon. W. Fawcett, Director of Public Gardens and Plantations, for the efforts he has made in different ways to recommend its adoption in the island. As the result of Mr. Palache's efforts, several of the branches of the Agricultural Society in the parish of Manchester took the matter up and started banks, adopting the proposed scheme in its entirety. Mr. Palache prepared all the necessary books and forms, the system obtained the sanction of the Government and was regis-

tered under the Industrial and Provident Societies Law, 1902. From some cause or another all but one of the various banks that have started have ceased to exist, and it is supposed that the Christiana People's Co-operative Bank, Ltd., is the only one in operation in Jamaica at the present time. This bank was started on May 22, 1905. The system was very carefully explained before the bank was started, and since its commencement, meetings have been held in some of the surrounding districts, and the benefits of the bank placed before the people. Although initiated in connection with the Christiana Branch of the Agricultural Society, the loan bank was started as an idependent concern, as some of the members of the branch did not approve of its policy. The number of members at its commencement was twenty, but three of these dropped out at an early period. In December, 1906, the membership was twenty-six, and there were also three depositors. This is not a large number, but it is believed that it will be largely augmented in the near future when it is found that the bank is firmly established, and when its benefits in giving loans are realized by the people. The share has been fixed at £5, and each member of the bank must be a holder of at least one share. The large size of the share, and the fact that it cannot be withdrawn, have prevented from joining many of those who would probably have done so had the share been fixed at £1, or if it had been possible for members to withdraw from the bank after joining. The fixing of the share at the higher amount, while lessening the number of those seeking to join, has had the effect of securing that only the most trustworthy and industrious men have become members. It is considered better to have a small number of substantial men than a large number, some of whom are unreliable. While the shares cannot be withdrawn, they may be transferred from one to another, so that at death, or on leaving the island, a member will not lose all he has paid. We believe the time will come when the shares will be sought after, and will realize when sold more than their par value. The shares may be paid up at once, or by instalments. If the latter be adopted, the minimum rate of payment is 2s. per month. This gives four years to pay up the full amount of one share, and makes the payment of a share within the reach of every industrious man. At the present time, only two of the twenty-six shares are fully paid up. The monthly payments are being well kept up, and there is not much over-due to the bank. The entrance fee is 2s. 6d., a book of rules costs 2d,, and a passbook 3d. This is all the outlay needed. The bank is managed by a Committee of five, and has a President, Secretary, and Treasurer. All these officials are at present honorary. The members of the bank are men of high character and are among the most influential men in the districts in which they live. They are chiefly Day School teachers, who firmly believe in the bank and the benefits it is able to confer on the people. The bank commenced to make loans in May, 1906, and seven have been made up to the present for "improving cultivation," "purchasing stock," and "purchasing land." The value of these loans is £38. The first one has matured and has been repaid. The period for which loans are made is restricted to six months. At present, the lending is confined to the shareholders, but as the bank grows, and more money than the shareholders are likely to require becomes available, the operations may be extended to outsiders. Already it has refused several applications for loans to outsiders. The interest charged on loans is 10 per cent., or, roughly speaking, ½d. per £ per week—a rate that is surprisingly low to people who have paid 6d. or even 1s. per £ per week interest. After paying all the initial expenses, the reserve fund stands at £1 18s., there are £20 in the Savings' Bank, and £32 out on loan. Of course these are small sums, but it is the beginning of a new and untried system among a not too confiding people. The bank has existed since May, 1905, and is steadily, though slowly, gaining ground. When the shares are fully paid up, at the present number of members only, £130 will be available for the accommodation of the best of the small settler class in the district the bank serves. Before the bank was started, this class of the community had no means of raising small loans to help them in their cultivation except from the usurer with his exorbitant interest, and it is felt that there are many men of the small-settler class who are honest and industrious and worthy of all the help that can be given them towards working their way up to a better financial position than they now occupy. The bank is a deposit as well as a loan bank. A beginning has already been made in this direction, for there are three depositors at present, and it is believed that it should be of great service to the community in this way, seeing that many of the people, especially of the labouring class, have no secure place for putting their money at deposit. It is hoped that people will soon realize this, and will come forward in large numbers as depositors. These are some of the chief

features of the Christiana People's Co-operative Bank, Limited, and there would appear to be no reasen why similar organizations should not be started in Jamaica and other parts of the Empire for the benefit of a deserving people.—*West Indian Bulletin*, Vol. VIII, No. 3, 1907.

HINTS FOR SCHOOL GARDENS.

We have received from the Imperial Department of Agriculture for the West Indies a copy of a useful little work entitled "Hints for School Gardens," by A. H. Kirby, B.A., Agricultural and Science Master, Antigua, which is published as No. 48 of the well-known Pamphlet Series.

In the introduction the writer points out that the real purpose of instruction of school garden is not merely for the purpose of showing how to grow vegetables, although this knowledge is gained incidentally, "but it derives its value from its usefulness in training the intellectual faculties, especially those of observation and correct inference, and its power to do this is the best indication of its real worth."

Throughout the work the writer appears to always keep the above object in view.

He also advises that "pupils should be put through a good course of box and pot culture, and should thoroughly master the principles underlying it before they are allowed to proceed to the cultivation of plants in pots." This advise seems excellent, and as only a small outlay is required in box and pot culture, this form of object-lesson might well be adopted in all schools, not only as preparatory to work in a school garden when the school possesses one, but also in those schools which at present are unable to afford the initial expenditure in establishing one.

The first part is taken up with clear and concise instructions for carrying out the different operations in raising and subsequently caring for plants grown in pots and boxes. The rule given for performing each operation in this method of cultivation are followed by a brief explanation giving the reasons why the instructions must be carefully carried out if success is to be attained.

These short and clearly-worded explanations are in every way admirable and will serve to give the pupil a good acquaintance with the requirements of plants in general. In fact, the whole of this part forms an excellent introduction to the chief facts of plant phisiology. The boy who has gained some knowledge of the way in which plants live, what they feed upon and how and under what conditions this food is absorbed has, apart from its educational value, already gained a sound grounding in the first principles of agriculture which cannot fail to be of great practical benefit to him later.

Then follows a course of Preliminary Lessons for the commencement of plot work, which includes instruction in the formation of a school garden from the very beginning. The pupils are taught in the different lessons how to prepare and mark out the ground, to plant hedges and to make up the plots and beds. The raising of seedlings for planting in the plots is assumed to have been learnt already in the lessons on pot and box cultivation.

The third section of the pamphlet is occupied with special instructions for growing all of the ordinary vegetables and economic plants, other than trees or shrubs. Here again it will be almost impossible to improve on the short, simple and precise directions given for each kind of plant, which include the distances apart and methods of planting and subsequent treatment, as well as the time usually taken for the crop to arrive at maturity, and the kind of soil which has been found to be the most suitable. A chapter on the various methods of Budding, Grafting, and Pruning, written in the same clear style, closes the work.

The pamphlet can be thoroughly recommended for its general arrangement, clearness and practical utility, and we have no hesitation in pronouncing this work to be the best that we have met with, dealing with this subject. It should be in the hands of every school master who has anything to do with a School Garden. It is obtainable at the Daily Chronicle Office, and the low price of 4d. at which it is published will place it within the reach of almost anyone. *Journal of the Board of Agriculture of British Guiana*, Vol. I, Nos. 1 & 2, July and October, 1907, pp. 41-48.

CHILDREN'S GARDENS AND THE PUBLIC.

BY FRANK M. MARSH,
Superintendent of Schools, Fairhaven Mass.

I am always glad to speak upon this question of children's gardens, because of the fact that it seems to me to be a movement which perhaps above all others may be an entering wedge to really enrich the school life of our boys and girls, and at the same time, plant roots and ideas which may result in a

more wholesome, more enjoyable, and possibly more profitable life. It is a clearly recognized fact that all our education in the past decade has been toward the city and toward urban conditions. This tendency has developed so many evils both in overcrowding the city conditions and in depopulating the country towns and villages, that it seems to me any movement which may serve as a check to the unwise migration to city and commercial and manufacturing centres may be worthy of encouragement. The whole subject of better rural conditions and more wise use of the uncultivated areas of New England would mean a happier and more profitable life for many of the young men and women who drift into the humdrum, unsatisfying, and sometimes destructive conditions which they attempt to cope with in the crowded centres. It seems to me that these conditions may be checked at least, if there can be developed a more wholesome respect for rural life and more intelligent application of the efforts of young men and women to the cultivation of the soil and the establishment of attractive homes. After these most excellent papers which have just been listened to by you with so much interest, from the attention which has been given to this subject in the last few years, and after many successful experiments on a small scale, I think there is at this time, not much need for argument in a gathering of this sort, in favour of children's gardens or in favour of attention to horticultural and agricultural betterment. When you stop to think how much of life depends upon the products of the soil, how much of life is effected by environment, we can easily see that the time is not far off when there is to be a reaction, we trust, which will mean that more people, when properly informed and guided, will prefer the safe and wholesome and comfortable conditions of the New England village and homestead, rather than the unhealthy and soulless employment found in mill or factory; and it is for the sake of creating this better attitude and more intelligent understanding of the opportunities and enjoyments of rural or village life, that the study of gardening and horticulture in our schools should be introduced. I think we may fairly presume that this is an assumption which will not be questioned. This topic, however, calls for discussion of the school garden and the public. The public of course may mean almost anything. We might as well admit and recognize at the very start that the public or public opinion is a factor which has to be seriously considered. The schools are public schools. In a way, they have to be what the public demands, and what the public is willing to support. Hence it seems to me that the immediate problem foi children's garden workers and for those that have horticultural and rural improvement schemes to advance, is to create an intelligent and proper attitude on the part of the public toward these movements. During the year we have been frequently asked how to make school gardens work successful, and the answer to such a question would have to be so varied for different communities and for different individuals that of course we have been unable to give any satisfactory answer, and as I understood this to be a very informal meeting, I will take the privilege of offering a bit of testimony as to the introduction and progress of this movement in the town which I represent. Some four years ago, the superintendent caught a bit of inspiration from one of the original American school garden enthusiasts, the former chairman of this comaittee, and, after mulling the matter over, broached the matter to members of the school board. They at least could see no harm in the proposition, and in a way were led to become somewhat interested in it, possibly with a little feeling of scepticism and doubt, but yet with some confidence that it might be worth while, and specially because we were not to ask for any money out of the public treasury. We proceeded on faith, getting some of the boys and girls interested, getting a friend to plow, getting the President of the Improvement Association and other officers sufficiently interested to lend a hand with spade and fork in converting a rough corner lot near the school building into a well-graded plot, and by quiet agitation developing enough momentum of opinion, to at least make some defenders of the movement when the first bit of ridicule and public doubt arose. For a time there was discussion on this side and on that, some were ready to cry fad, fad, and foolishness; others were ready to admit the excellence of the idea, while expressing feelings that it was impractical; others expressing interest and enthusiasm. I think probably this would be the normal condition when such movement was introduced anew. Next the children were inoculated with interest and ambition and hope, and this became contagious, and much work and much profit from this understanding was accomplished by the children. Someone had to bear the brunt of the planting, someone had to see that conditions were such, that success was certain, and when everything was plotted and planted, all sorts of hopes and fears were entertained as to what the results might be. To

make a long story short, the careful, orderly, and bountiful results were such that the sceptics and scoffers grew less and faded away, from the time the first shoots appeared, until the rough plot of ground blossomed with flowers and plants of many varieties, and teemed with vegetable growth which was both good to look upon and profitable for consumption. So well had the children done their work in the beginning, so faithfully had they cultivated their growing plants, that some of the good ladies and interested men who had tried experiments in their own yards, thought there must be some sort of trick about the thing; some mysterious feature as to how it was done. Several people thought it must be in the seed and at once inquired where we obtained the seeds. After this successful summer there was no further opposition or criticism, and for the past three years many have been the kind words and comments, and generous has been the encouragement and attitude. The public confidence needed to be won. To do this, it was necessary to demonstrate the feasibility and the profit in such a movement. The Improvement Association which happened to be made up of men and women who could appreciate the value of such a movement, were ready to make an appropriation, and by this time the school department was willing to pay for some of the necessary tools and some of the larger items. The next year the Improvement Association was only too glad to duplicate its contribution. The school department had no hesitation in paying part of the expenses of maintenance. The Improvement Association, furthermore, was ready to extend the movement and expend more money in starting home gardens, and for two years has successfully carried on this work, creating a special committee to direct it. This year the school department, representing the public as it does, recognizes the fact that it is a legitimate expenditure from the public treasury to pay for the major part of the expenses of supervising and maintaining this department of school work, and I think it is safe to say that public opinion has been won in favour of children's gardens at school and at home. The question has been raised by the previous speakers as to two very important features which now perhaps need attention more than others—First, the educational value of the movement, which is generally admitted; second, shall the colleges and normal schools provide better training for teachers who shall carry on this work. In discussing this matter of children's gardens recently, I ventured to point out that while an enthusiast with perseverance and careful study could win over public opinion in favor of the movement; it was not an easy matter to find such an enthusiast or such a teacher to carry out this work, and we ventured to suggest that the state of Massachusetts might better spend some of its money in the establishment in all our normal schools of departments or at least courses for the training of our teaching forces along these lines. Some of this work is done at some of the normal schools, but in few is it done in such a way as to really inspire enthusiasm on the part of the graduates or a board understanding of the aim and policy and general purpose of such a movement. It is too often touched so slightly that the graduate is not prepared to even introduce the work; is not prepared to help mould public sentiment; is not prepared to overcome the obstacles which are bound to appear. My contention is that the State can well afford for many reasons to create such departments in the normal schools and to make them of such interest and importance that some of the teachers at least will be capable and anixious as they go out into the rural and village schools to develop a more intelligent interest, a more generous attitude toward rural conditions, and a better knowledge of the possibilities and enjoyments of non-urban life. I say the State can better afford to do this than afford many other expenditures which will bring fewer returns. It has been said that the public school should aim to produce best men, best women; if you please, the best citizens possible. In a democracy the chief care of the State is to improve and train its members who are the foundation of the republic. I have often asserted that the home and family is the most potent and effective unit in our social and political life, and it is the improvement of our homes and the consequent love of home which the children's garden movement engenders, that is to bring about the rewards for whatever is put into this movement. I may have mentioned in your presence before, that there will be no lack of patriotism, genuine patriotism, on the part of the people who have homes which they love and which they will be willing to defend at any cost.

I am impressed with the fact that thousands and thousunds of dollars are expended by the State for immense armories and military equipment and expenses with all their pomp and glitter, and at the same time I think of these armories as being used only infrequently by a few. We can recall that the very

best fighting and the best defence that has ever been made was not done by the trained and richly equipped red-coats of Great Britain, but by the embattled farmers and home lovers of Charlestown and Boston and Bunker Hill. As our late lamented Senator Hoar once said, "Times were when men were proud to strike for their altars and their fires, but you hear very little of men striking for their flats and furnaces." The men who will be most anxious to defend their country, the men who will be most patriotic to stamp out the evils of city corruption and commercial crime, will not be the men who frequent the crowded cities and factories, who live like cliff dwellers in the high apartments of our great cities, but it will be the sturdy, home loving, patriotic citizen who has been kept in better tone and in a better environment in a homelike home, and has developed a higher appreciation of what life may mean. The State furthermore can better afford to give some thought to this phase of her development, since it is without question upon the soil and upon the country slums that humanity must depend for supplying the commodities which go to make up the activities of the city, and for supplying man with the necessities and comforts of life. The great problem of the slums in our cities, and the great problem of the village and country slums may be improved by instructing these people as to the possibilities of a plot of ground properly cultivated, and when we think of our vast acres of Massachusetts land now unused, and the many who are practically starving in the crowded centres, it would seem a legitimate investment for the State to expend public money upon any movement which would tend to encourage the better appreciation and development of our agricultural and horticultural resources. The points which I should like to make are these: that the educational value of children's gardens is becoming questioned less and less; that public opinion as a force has to be recognized and won in favour of this movement. To do this, the introduction of the movement must be well planned; the soil must be well prepared; and the workers of the soil must be carefully inoculated with correct ideas and right attitudes and aims. Societies and associations with similar aims must be enlisted and drafted in aid of the movement. The newspaper can be a powerful force in advertising and spreading the news of the movement, but what is needed most of all is courage on the part of the State to provide as well for this phase of education in training teachers for this work as in training teachers of arithmetic, of geography, or of language; that is the business of the State to help create a better attitude toward the betterment of rural and village conditions, and especially to train children to be men and women who will organize such homes themselves will be enjoyable to old and young and be incentives to patriotic and loyal citizenship. We can teach civics and talk about citizenship, but we shall get very little civic righteousness or undefiled patriotism unless we can establish a wholesome and nourishing background of excellent homes and home life, and I believe there is no other one movement which can be made to serve in the development of good homes and finer sentiments than the movement for better gardens, better home surroundings, and more attractive life away from the deadening influences of the factory and competition of the crowded city.—*Transactions of the Massachusetts Horticultural Society, for the year 1906*, Part II.

SCHOOL GARDENING.

By LUCY R. LATTER.

School-Gardening, its place in education, should be the title of this article, for, owing to much uncertainty and difference of opinion on this point, there is a great deal of doubt among teachers and others as to the wisdom of taking gardening with school children at all. Such people see nothing in it but another subject added to an already overcrowded curriculum. They feel that unless the work be taken after school hours there is but little chance of sufficient time being obtainable, with the rest of the school work, for the children to really do the gardening. The chances are, therefore, that the bulk of the work must, in the long run, fall upon the teachers, and more harm than good be done to the children and them alike. Let us see how the problem is to be solved that such an occupation as gardening may become a source of real pleasure and ever-increasing knowledge.

There are two points of view from which the subject of gardening may be considered, namely, as a direct aim in itself, or, as but a *means* towards a given end. It is because people have not realised the difference between these points of view and their relative value that so much confusion and disappointment have arisen in taking gardening with school children. I hold that the duty of the ordinary school teacher is not to train all his or her scholars to be good gardeners, any more than to train them all to be good builders, painters, or the like, but so to use

the art underlying any one of these traders as to awaken an all round intelligence in the children, and a love of the beautiful, the true, and the good, and at the same time provide a means for healthy bodily exercise.

Gardening as an art *per se* should have no place in any general scheme of education, and any attempt to force one for it must sooner or later lead to disappointment, and probably even to the giving up of the work. The sooner we realise this fact the sooner shall we get school-gardening put on its only workable basis in the school-life of our children, that is to say, taken as a *means* to a given end, that end being the all-round development of the child. Herein lies the solution of the question of gardening with school children.

There is no more delightful or healthy work for children, or even grown up persons, than gardening. The digging and preparing of the soil, the sowing of seeds therein, the daily tending and watching of living and growing things, the observation of the natural phenomena which affect the life of the garden, all have a strong fascination for children of almost the tenderest age. By fostering this love and care of and for the things of Nature, we are not only creating in the growing boy or girl a love for a healthy occupation which will safeguard them against the *ennui* which so easily besets us, and cause other evils, but also doing much to secure them happy memories in later life.

Experience proves ever more and more strongly that Nature teaching, or gardening, should be the centre point of all the other (secular) work of any school children up to, at least, nine years of age; and it should certainly have a large place in the work of schools for scholars of more advanced age. What an admirable means it offers for the teaching of most of the sciences to the growing boys and girls! In keeping, for instance, a record of the sun's annual "journey" in the heavens, the science of mathematics could be well applied with the senior scholars. They could be helped to find out the angle at which the sun's rays touch the earth at given seasons and given latitudes; the ratio of the shortening and lengthening of shadows with the days and seasons, and many other interesting facts. In this way a living interest is given to what might otherwise be a dull science. How much more interesting would the cookery lessons be if the girls grew all the vegetables they needed in little gardens of their own in the school play ground? How valuable the power thereby obtained of being able to go to market and discriminate between fresh and stale vegetables!

The way in which school-gardening can be made an integral part of the life of a school has been fully worked out in my book "School Gardening for Little Children."* Here I will, therefore, confine my attention to some difficulties which many teachers seem to experience in taking up school-gardening for the first time. And in dealing with these I may, perhaps, be pardoned for referring to what has been done in my own school.

Our garden consists of a strip of ground 80 feet by 8 feet, divided into two portions, one portion being reserved for a kitchen garden, the other for a flower garden. These two portions are each sub-divided by transverse paths into eighteen little beds, so that the children can work quite easily upon all the beds. It is impossible for little children, at least, to reach over and garden from one end of a big bed.

The garden belongs to the whole school. Each class has so many (six) beds on which certain children work for a year, and so follow the life story of some of the plants and creatures of the garden from beginning to end. Two children (a girl and a boy) work on a bed. They may have help from their comrades at any specially busy time, such as when the garden needs a good weeding after a long holiday. The children who do not own a bed in the garden any given year have plenty of indoor and window gardening.

Annuals are chiefly selected for growing, and all of these, as well as any animal inhabitants, and the various natural phenomena which affect the life of the garden, become, in turn, and in due season, objects of specific study with the children in school. As far as possible, plants and creatures of the same kind are also then kept in school, and specially tended and watched by the children who have no outdoor garden that year.

Whilst it would be impossible with our method to study every plant as it comes up in the garden, the seeds, bulbs, etc., are always selected with regard to the subjects we propose to study specifically with all the children in ensuing seasons. Generally the plants are grown the year previous to the one in which they are grown to receive specific attention. This plan affords an excellent opportunity for the staff to get an intimate first-hand knowledge of such plants beforehand; and also for the children then to get a general impression of them. The Spanish Iris and the Flax are among

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* Published by Messrs. Swan Sonnenschein.

the subjects for our special consideration this year. We have grown both these plants in the school garden at least two years in succession, and so are familiar with their habits, etc.

Although, however, these subjects are on the list for this year's work, we shall not take them if, by any unforeseen chance, the sowings of this year in our garden fail us.

We follow Nature, and wait until she is ready to give us of her bounty to try to learn something of her marvellous ways and workings.

Hence, whilst it is well and possible to have a general prospective plan of work for the whole year, it is scarcely advisable to attempt to make any detailed plans for all the subjects which are to be considered during the course of the year too long ahead before many of the things have, perhaps, even been planted. The growing plants, etc., often suggest details for a coming specific plan.

Nature will not be controlled by any iron reckonings. We have, therefore, no day and hour specially reserved for gardening. On our time-table is the following note: "Groups of children for work in the garden with the head, or some other, teacher at *least* forty-five minutes a week, according to weather, and the needs of the garden."

The words "at least" suggest that much more time is given to the work on occasions, and this is the case. At some seasons the little gardeners may be out a whole afternoon at a time. Work may be done in the garden any morning during the time then allotted to the care of natural objects, during either of the two weekly Nature lessons, and any time in the afternoon when the head mistress or a senior pupil-teacher is not engaged in any special work which might prevent either of them from being able to free the class-teacher for the work, or from taking it themselves. This leads to a consideration of the question of the *number* of children which may be taken for gardening at a time by one teacher, and if only a small number, how the other children of the class are occupied the while.

It is impossible for one teacher to take gardening (if the children are really to do the work, and be interested in it) with fifty or sixty children. The moment that is attempted the work is over-organised, and its value lost in drill. No one teacher can take gardening with more than eight or ten children at a time, except, perhaps, for such operations as weeding and watering. Plants even of the same family set on the same day and at the same hour do not always

come up at the same time or in the same way. How much less so, therefore, plants of different kinds! Probably no two little beds require the same treatment at a given time. It is hardly fair, therefore, to expect that any teacher should be able to direct such a multiplicity of operations as would be inevitable with a large number of children working at one time on their gardens, with happy results.

Our children are consequently taken in small groups for work in the garden. The remainder of the class go on with the work specified on the time-table under the care of whatever teacher can be free for the time being. No observations or sketches are made on paper by the children during the time they are out for the purpose of gardening. Such work is done afterwards, in or out of doors, as may seem best. The children often go out alone to draw from Nature in their school garden.

School gardening means without doubt a certain amount of trouble and planning on the part of the teacher. She needs to be a most careful and skilful organiser, and a lover of Nature, in whose

> "Hundred-gated Thebes every chamber is a door,
> A door to something grander,—loftier walls and vaster floor."

The value of such work as gardening to the children physically, intellectually, and morally, more than compensates for all the trouble and time the teacher has to expend upon it. Nothing is more delightful than to witness the joy of the children in the work, and their ever-increasing care and solicitude, not only for their own little school-gardens, their home and other gardens, but also for the creatures which they come across in them. The effect of this new attitude towards living and growing things shows itself further in the way in which the children behave towards each other. They unconsciously become gentler and more sympathetic in their manner, and rough play no longer appeals to them. This change must tell in the larger community of society and materially aid in doing away with those impulses which find their bent in hooliganism.

It is most gratifying to know how rarely any damage is ever done to the garden, although it is situated in a playground used daily by upwards of seven hundred children, and is wholly unprotected from intruders. An occasional footprint on a bed or a broken flower is nearly always to be traced to a new child, or to quite an outsider, who has never before been encouraged to love and protect some of the wonderful

things of Nature. But such children soon become ardent protectors of the tender flowers and plants. Thus,

> "Nature holds in wood and field
> Her thousand sunlit censers still;
> To spells of flower and shrub we yield
> Against or with our will."

—*Sudley College Agricultural Journal*, Vol. II, No. 8. Sept., 1907, pp. 107/109.

A MESQUITE GROVE IN HAWAII.

By Charles S. Judd.

A curious grove of mesquite exists on one of the islands of the Hawaiian group, and is interesting because of the fact that it was planted by horses.

The mesquite (*Prosopis juliflora*) is a common tree of our South-western States and Mexico, where the people "climb for water and dig for firewood," or, in other words, tap the cactus for water and dig in the ground for the long, woody roots of the mesquite.

The tree reaches a larger size and grows taller and straighter in Hawaii, where it goes by the name of algarobo, than in the South-west. It was introduced into the islands from California in 1837 by Father Bachelot, and the original tree which he planted on the grounds of the Catholic cathedral in Honolulu remains to-day, although somewhat mutilated to make room for a new business block.

No other imported tree has spread so rapidly or has proved to be so valuable in Hawaii as the mesquite. Since its introduction it has spread over more than 50,000 acres of what otherwise would be worthless land. It grows best on the lowlands, but by gradual acclimatization it now thrives at an altitude of 2,500 feet. The tree is seldom found growing well on the windward side of the islands because the salt air blasts the foliage.

It has become the principal fuel tree of the islands on account of its high calorific value, rapid growth, ready regeneration and accessibility to market. The pods, borne on the trees in immense quantities, are rich in nitrogen, and form one of the principal foods for the fattening of cattle, horses, and other stock. The flowers furnish an excellent, clear honey, and most of the apiarists depend entirely on the mesquite for the pasturage of their bees.

The rapid spread of the tree in Hawaii is due entirely to cattle and horses, which do not injure the seeds in the eating of the pods, but rather prepare them for quick germination.

But to return to our particular mesquite grove. This is found at Kipukai, on the island of Kauai, in a semi-circular basin surrounded on three sides by high mountains and on the fourth by the open sea. The particular situation occupied by this grove is somewhat protected from the full sweep of ocean breezes by a line of high sand dunes which fringe the beach. The soil on the area is a rich loam composed of fine calcareous sand mixed with alluvial soil washed down from the hills.

Corn was grown with great success at one time in this soil, but the owner desired a stand of mesquite trees on account of the rich fodder and fuel which they produce. Repeated attempts at planting the trees by hand met with failure, and so the ranchman hit upon the following novel scheme. He fed up a drove of horses on mesquite pods, and driving them through the pass over the mountains turned them loose on the area where the soil was in proper condition for the reception of the seed.

The device worked like a charm, and complete success was obtained. To-day, seven years after the pod-fed horses were turned loose, about fifteen acres are covered with a dense stand of mesquite trees which average 30 feet in height and 6 inches in diameter. The trees are already bearing pods abundantly, and not only does the grove supply food and shelter for the stock, but also a copious supply of fuel in this barren spot where formerly the few inhabitants were compelled to depend entirely upon driftwood.—*Forestry and Irrigation*, Vol. XIII, No. 4, April, 1907.

THE SMALL-HOLDINGS COMPETITION IN JAMAICA.

By W. Cradwick,

Travelling Instructor in Agriculture, Jamaica.

After several years' work among the peasantry of Jamaica as an Agricultural Instructor, and connexion with many of the Agricultural Shows in the country, I arrived at the conclusion that something was required which would reach the peasant more directly and stir up in him a livelier interest in his everyday life.

To this end, a plan, based on a competition for cottage gardens, which I had seen carried out by the Hawkhurst Horticultural Society in England, was drawn up. This was called the Small-holdings Prize Scheme, and was placed before the Commitee of the Experiment Station at Hope Gardens, with the sug-

gestion that they might use their influence with the Jamaica Agricultural Society, in order to induce them to provide the money necessary to put it into operation.

Considerable delay occurred, but on his Grace the Archbishop taking up the scheme it was put into operation. On account of the preliminary delay, it had to be hurried in such a way as to make it fit into the financial year, and for want of proper personal advertising and explanation of its aims and objects, a good deal of suspicion was encountered. The entries for the first round of the competition were, therefore. very small.

The scheme as originally drawn up was published in the *Journal of the Jamaica Agricultural Society* (Vol. V, p. 14), and provided for prizes to be given for the cultivation of land and for the establishment of permanent or staple crops, to be competed for amongst small settlers and property headmen in different parishes of the island.

Some persons opposed to the scheme attempted to make a great deal of the apparent lack of interest on the part of the people whom it was intended to benefit, pointing to the small number of entries as evidence that it was unsuited to our peasantry and would never gain their confidence.

The lack of interest, however, was only apparent; the peasants' suspicion of the scheme was real, and who could have expected it to be otherwise. The scheme was put into operation and was intended to benefit a class whose chief acquaintance with the Government was through the Tax Collector; and any scheme in which the Government had even the smallest share was necessarily associated in their minds with a deep-laid plan to still further increase their taxes. That this suspicion was not unconquerable was the firm belief of the promoters of the scheme, for they were convinced that a scheme which so thoroughly entered into the details of the daily lives of the people in their own homes would in time become exceedingly popular.

The chief cause of the small number of entries during the first round of the competition was because the parishes were not sufficiently canvassed, and the scheme was not thoroughly explained to the people who were expected to compete. This was borne out by the fact that in Hanover, the first parish in which the scheme was properly explained, ninety people entered the competition.

The ministers and clergymen of all denominations took up the scheme heartily; the school teachers were perhaps even more enthusiastic, and on the latter becoming competitors, in many districts, the last breath of suspicion was blown away.

During the first round of the competition, the judges came to the conclusion that the money would be more profitably spent if divided into a larger number of prizes. The Rules were therefore amended to practically their present form, and are now as follows:—

'Prizes will be awarded for cultivation of land, and the establishment of permanent or staple crops.

'Only persons holding not more than 20 acres of land to be allowed to compete, and the land entered for competition must be one piece, not divided by other persons' property intervening; but a road, river, or gully may run through it.

'The residence of the competitor to be on the ground entered for competition; and such residences and grounds to be situated near (within a stated distance of) a Main or Parochial road.

'The prizes to be allotted in three classes:

First Class	Holdings	not over	20 acres.
Second	,,	,,	10 ,,
Third	,,	,,	5 ,,

'No person to compete in more than one class, but competitors may select any class for which he or she can qualify, and no prizes will be awarded unless there are at least twice as many competitors as there are prizes offered.

'Prizes to be given in each parish as follows:—

	1st Prize	2nd Prize.	3rd Prize.	4th Prize.	5th Prize.
	£ s. d.	£ s. d	£ s. d	£ s. d.	£ s. d.
1st class holdings not over 20a ...	4 0 0	3 0 0	2 0 0	1 5 0	0 15 0
2nd clasa holdings not over 10a. ...	3 0 0	2 0 0	1 10 0	1 0 0	0 10 0
3rd class holdings not over 5a. ..	2 0 0	1 11 0	1 4 0	0 16 9	0 9 0

'No person to be allowed to compete in Class I unless he or she has five acres in permanent crops such as coffee, cacao, oranges, grape fruits, limes, coconuts; no one to be allowed to compete in Class II unless he or she has three acres in such permanent crops; and no one shall be allowed to compete in Class III unless he or she has one acre in such permanent crops.

'The judging will be conducted on a system of points as follows:—

Permanent crops	Points	30
Catch crops	,,	15
Fences, gates, and general condition of holding ...	,,	15
Live stock	,,	20
House	,,	10
Sanitary conditions etc. ...	,,	10

'The method of cultivation and condition of the crops grown, rather than the kinds of crops grown, to be considered by the Judges. Crops for which premiums are awarded need not necessarily have reached maturity, and points may be given for cultivation in progress, provided it is, in the opinion of the Judges, sufficiently advanced to admit of its being judged. The Judges to consider the circumstances of each cultivation as well as the cultivation itself, including the implements used.

'It should be competent for the Judges to withhold any or all of the Prizes if the Holdings entered for competition are not considered of sufficient merit.

'Three months' notice, at least, to be given before judging commences, and the decision of the Judges in all cases to be final.'

It is now four years since the competition was put into operation, and the largely increasing number of entries is sufficient guarantee of the popularity of the scheme among the small settlers.

With regard to the benefits of the scheme, I think these are so far in excess of the money required to carry out the competition, that it is hoped that the Agricultural Society will see its way to keep to that part of the original plan, which provided for the competition being held in every parish every third year, necessitating judging four parishes during two consecutive years, and five parishes in the third year, so as to embrace the thirteen agricultural parishes during the cycle of three years.

There is of course a great deal of very hard and laborious work to carry out the scheme properly; nearly all the holdings are situated in the mountains; many of them in parishes such as Portland, St. Thomas, St. Andrew, St. Ann, and St. Elizabeth, where they are situated on the tops of high hills and are such that very few of them can be ridden to. After a month or five weeks of such work, there is little energy left in the Judges for some time afterwards.

If the competition can be so arranged that the people can rely on its taking place every third year, and the Instructors are able to hold up this as an inducement before them, I am quite convinced that the present benefit of the competition would be more than double with the same expenditure of money. Continuity, which seems so hard to obtain, is the keystone of success in matters such as this.

The great thing needed among our peasantry is stimulus to exertion. The Small-holdings Competition has supplied this in a manner which far exceeds even the most sanguine hopes. The amount of work which is put into a holding in the hopes of winning what after all can only be a very small prize, would astonish any one in this audience who has not actually seen it. Pruning and cleaning up of cultivations, grooming of stock, repairing of roads, walls and fences, tanks, and houses, white washing, and painting are what were expected; but when it is observed that new cultivations established from the time of the first competition, men buying and keeping cows, new tanks, new walls, new gates, sanitary systems established where none were before, stables erected, and even new houses built in order to try and win these prizes, it must be acknowledged that this scheme has taken a hold upon the peasantry and acted as a stimulant to them, the value of which can never be over-estimated.

For the recent competition in St. Ann, Mr. Arnett and myself calculated that there could not have been less than £1,000 worth of labour put into the different holdings competing.

It is interesting to hear the views of the competitors themselves. In the beginning, the competitor was often met with who timidly asked for personal assurance that the Government did not intend to take away their places; others were afraid taxes would be raised; some thought that the shilling would have to be paid every year as long as they live. But now it is found that although the suspicions are not entirely killed, they become less and less each year, and the comments are assuming an entirely different tone.

I have perhaps left the most beneficial aspect of the scheme to the last, and that is the unrivalled facilities it affords for practical instruction. It gives an Instructor an excuse for going into places, and insures him a welcome, which I think he would have looked for in vain for many long years, had it not been for the institution of this competition. The mere judging of the holding and awarding of the prizes are as nothing compared with the patient inspection and pointing out in a friendly spirit the possibilities for improving almost every department of that which constitutes their home and home life. From this aspect alone, it is obvious that the

scheme is worth far more than the expenditure involved.

In conclusion, it should be mentioned that this scheme breaks down the barrier of suspicion existing between the Government and the peasantry, and that the stimulus supplied by it is not by any means confined to the competitors, for the effects are often seen over whole districts.

THE PLANTERS' ASSOCIATION OF CEYLON, KANDY.

(Extracts from Fifty-fourth Annual Report for the year ending 31st December, 1907.)

In presenting the 54th Annual Report your Committee desire to congratulate the Association on the generally satisfactory conditions of the chief planting industries during the year under review.

BRITISH IMPORT DUTY ON TEA.

An appeal has been made to the Proprietors of Ceylon tea estates by the Secretary, Anti-Tea-Duty League, for funds to carry on the campaign for the reduction of the Home Duty to at least 4d. per pound, at which figure it stood from 1890-1900, before the additional war tax was imposed.

This appeal has received the endorsement of both the Indian Tea Association and the Ceylon Association in London, and your Committee would heartily commend it to the attention of all Tea Companies, Agencies, and other Proprietors in Ceylon.

It is estimated that a subscription of £20 for every million pounds of tea produced would yield funds sufficient for the prosecution of the proposed campaign.

A leading firm of London tea brokers write in connection with this subject:—

"It may be well to point out that with a 5d. duty the annual increase in consumption, which ceased during the recent periods of high duties, has again been noticeable.

"There seems strong reasons for believing that were there a return to a 4d. duty, there would be a still further increase in the use of Tea in the United Kingdom."

LABOUR.

This perennial question has throughout the year engaged the earnest attention of your Committee.

The serious falling off in the number of immigrant labourers for the year ending 31st December, 1907, showing a total of only 55,724 as compared with an average of 103,000 during the five preceeding years is strong evidence that additional inducements must be offered to coolies to immigrate to Ceylon if she is to retain command of the free labour supply so essential to the prosperity of the Island.

Free passages, increased pay or the issue of rice under cost price, estates bearing the loss, have been suggested as measures to attract labour, whilst the institution of estate kaddies and the keeping of individual cooly accounts in estate Check-rolls are becoming more general. The last named was the subject of a special recommendation from the London Association which was approved by your Committee.

The desirability of legislation in connection with the unsatisfactory condition of a considerable proportion of our present labour force owing to heavy indebtedness, leading to irregular working and the increasing of bolting and the repudiation of estate advances, was considered by a special Sub-Committee in un-official conference with the Hon. the Acting Colonial Secretary (Mr. Fowler) and the Hon. the Attorney-General. The resulting correspondence, &c., has been circulated to all members of the Association, and a resolution on the proposed registration scheme is to be submitted to Government.

Your Committee understand, though no official intimation has as yet been received, that it is the intention of H. E. the Governor to appoint a Commission to go into the whole labour question at an early date, and they trust that the labours of that Commission will conduce to a satisfactory solution of our present difficulties.

PLANTING PRODUCTS:

TEA.

Estates generally are in good heart where cultivation and manuring have been judiciously carried on, and to an extension of these operations, made possible by the higher prices for tea, must be attributed the larger proportion of the increased shipments for the year which totalled 176,117,016 lb. of Black and 5,906,716 lbs. of Green tea.

The season generally has been a favourable one for yield, though most districts suffered from a failure of the usual November-December rains.

Manuring and forking the soil has made weeding a more expensive item than two years back.

Where RUBBER has been interplanted in tea fields, the age of the plants, so far, has not had time to affect the yield prejuically in the generality of Low-Country Districts.

There is a good demand for Tea Seed which means an increased area under cultivation, and in Rubber clearings in Uva we hear of tea being planted as a catch crop.

The quantity of Ceylon tea sold on the London market in 1907 was practically identical with that for 1906, but the average price was nearly 1d. per lb. higher, viz :—8⅛d. against 7¼.

On the Colombo Market the record quantity of over 1,000,000 packages were offered for sale, and the year has been remarkable for the high rates ruling for common teas, and for the fact that notwithstanding this there has been no weight of really undesirable low class tea manufactured: quality, generally, although not so good as the previous year, has been fair throughout, but really fine standout teas have been conspicuous by their absence.

The feature of the year has been the greatly increased Russian demand, this country having taken in all about 26,000,000, lbs., of which about 9,000,000 lbs. were dusts and fannings, consequently the latter have been higher than ever before, and fine kinds realized extraordinary high rates, the average price for these ranging from 66 cents to 76 cents.

This demand is anticipated again next year.

The average prices have been consistently above those of the previous year, the average for the whole year being 40·87 cents against 34·82 cents for 1906.

The year closes with a very strong market, the statistical position showing that consumption is gradually overtaking production, and if no coarse plucking is resorted to, there is every prospect of as good or even a better market generally during 1908.

Bonded stocks in London are low and duty-paid stocks are reported to be very small.

The estimated tea crop for 1908 is 178,000,000 lbs. distributed as follows :—

		lbs.
United Kingdom	...	103,000,000
Russia ...	...	22,000,000
Other Countries	...	2,500,000
America ...	...	14,000,000
Africa ...	...	1,250,000
Australia ...	...	24,000,000
India ..	...	1,250,000
China ...	...	10,000,000
		178,000,000

GREEN TEA.

This year has shewn marked progress in this branch of the Ceylon Tea Industry, notwithstanding the fact that prices have been very much higher, in sympathy with Black Teas.

Production has shewn a distinct increase, and what is still more pleasing is the fact that shipments have also shewn a corresponding increase. The higher prices have somewhat curtailed the amount of business which might otherwise have been done in the United States of America and Canada, where our teas have come into competition with Japan's and China's, and it is indeed gratifying to note that American shipment figures show that we have more than maintained our footing in these markets, even although conditions have been somewhat adverse. Fortunately, the shortage in the Japan crop and the consequent higher prices for these growths assisted somewhat Ceylon Greens to hold their own.

Russian shipment figures are extremely encouraging, showing an increase of over 100% against the previous season, and a steady increase is looked for in this direction in the future.

The total production of Green Tea for this year is aproximately 6½ million lbs., against 4½ million lbs. for 1906. It is very gratifying to note that increased attention is being paid to manufacture, and this has undoubtedly helped to bring Cedlon Green Tea into favour.

Steady perseverance in this direction will go a long way to ensure further success in the future.

PUBLICATION OF DETAILED TEA PRICES AT COLOMBO SALES.

Only the averages of the invoices sold are now published.

COCOA.

The crop for the year was 92,500 cwts. being the largest yet shipped in any one year by 23,000 cwts., but this was in some measure due to the late ripening of the 1906 crop and the consequent inclusion of a larger proportion than usual in the shipments for 1907.

Prices have been satisfactory throughout the year occasionally reaching a very high figure, and although it is unlikely that these fancy prices will be maintained, still a study of the figures of production and consumption point to the fact that it is probable that prices for some time to come will rule higher than they have done in the past decade.

The agricultural position of the product is sound and the damage now done by canker and disease is of a trivial nature though constant care is still necessary.

With a proper system of pruning and cultivation, Cocoa can be made to yield satisfactory crops.

The estimate for 1908 is 70,000 cwts.

The Cocoa Stealing Ordinance is working well in Matale, but in other Kandyan Districts complaints have been received which seem to point to the fact that a more vigorous enforcement of the Ordinance is necesary.

CARDAMOM.

The crop for the year has been a fair average and of good quality. London prices for bleached from 1s. 3d. to 3s. 10d. and seeds from 1s. 10d. to 2s. 4d. per lb. Local prices have ranged from 75 cents to Rs. 1·35, while from 75 cents to Rs. 1·46 have been paid for Green-dried.

The demand from India for the latter has considerably increased during the year, the shipments to India, chiefly green-dried, have now exceeded the total shipments to the United Kingdom by 65,200 pounds, whilst shipments of bleached to Germany have fallen off. Turkey has taken 8,300 lbs. more than last year.

Total shipments have exceeded the estimate by 89,495 lbs. due probably to a larger balance carried forward from 1906 than was estimated.

The Cess of one cent per lb., collected for two years, lapsed on 1st October, and an appropriation of Rs. 10,000 was sanctioned by Government from the fund, for the distribution of samples and pamphlets through the courtesy of the various Consuls and others who kindly forwarded cases containing Cardamoms in ¼ lb. tins to Agents for distribution in the countries they represent.

The balance at credit of Cardamom Cess fund is Rs. 12,900.

It is believed that only a very limited area of land is suitable for the profitable cultivation of this product, and many of the Cardamoms planted a few years ago have been rooted out and the land planted with tea which grows well in old Cardamom land.

The total area now under Cardamoms as given in Ferguson's hand-book is 8,451 acres corrected to August last. Two years ago 9,000 acres were under this product.

The Crop for 1908 is not expected to exceed 700,000 lbs., as very little of 1907 crop is being carried forward to 1908.

The cost of curing has been considerably reduced by the increased demand for green-dried and by the introduction of the Cardamom clipping machine where it has taken the place of hand clipping.

CAMPHOR.

The cultivation of the Camphor tree continues to attract attention, though prices have fallen considerably.

The old, destructive method of obtaining the camphor is now being abandoned as too improvident to repay the expenses of cultivation. There seems to be a general tendency to look towards the leaves and new twigs as to the future source of commercial camphor. It is found that the valuable product is distributed throughout the whole system of the tree, and a method of cultivation, depending upon the production of a large quantity of leaves and twigs, is probably the one which will be aimed at.

RUBBER.

The acreage under Rubber in Ceylon is estimated at 155,000, and is probably the largest extent cultivated in any one country.

The growth of the trees is good and estates generally in satisfactory order, though in some localities scarcity of labour has caused weeding of new clearings to be both difficult and expensive.

Experiments are constantly being made to determine the best methods and intervals for tapping.

Biscuit, sheet and crepe are the forms of the cured product most in favour at present.

There is very little disease of any kind, and there is every reason to anticipate that recognized estimates of cost of production and yield per acre will be realised.

Towards the end of the year a heavy fall in the prices of raw rubber took place, principally owing to the financial panic in the United States, but there is reason to shortly expect a recovery in quotations which will last over the next few years, and even if prices fall considerably lower than they now are, Rubber in Ceylon should not cease to be a highly profitable investment.

The distant future of Rubber lies with the cheap producer, and it is probable that Ceylon can produce more cheaply than any other country.

The estimated export for 1908 is 360 tons.

RUBBER THEFTS PREVENTION ORDINANCE.

The draft of this Ordinance was submitted to your Committee and met with its hearty approval.

The Ordinance is drafted on the lines of that for the prevention of Cocoa Thefts, and will afford Rubber growers a similar measure of protection where properly enforced.

Coconut Products.

The year has been quite the best on record, for though crops were generally short, yet the high price of Copra in the early part of the year more than compensated owners for such shortage. On 27th of February, 1907, the price rose to Rs. 86 per candy, which is the highest figure ever recorded for this article in the annals of Ceylon History. The total export of copra (347,970 cwts.) was about 76,000 cwts. short of the quantity sent out in 1906; the coconuts in the shell were less by $2\frac{1}{2}$ million nuts. Oil also shows a falling off in shipment by 50,000 cwts.—460,683 cwts. going out this year against 511,720 in 1906, whilst Poonac, of course, shows a similar decline.

This falling off in crop is generally considered to be due to the very dry season of 1906, which seriously affected, in many districts, the young nuts then setting for maturity in 1907. Germany, again this year, was our best customer for copra, and took almost half of the total export, and purchases by Belgium come next, and show a heavy increase over the business done in the previous year.

Shipments to the United Kingdom dropped from twelve thousand to above three thousand cwts. Nuts in the shell, as in previous years, went chiefly to the United Kingdom, ten out of thirteen millions going there; while the markets for Yarn and Fibre remained much the same as in 1906. Prices for the New Year continue high, and a good season is anticipated, if normal weather conditions prevail, as the rainfall during the past year was sufficient and well distributed.

Batticaloa was visited by a severe cyclone at the beginning of March, with disastrous results to some of the Coconut plantations in the vicinity, where thousands of trees were uprooted and damage to the estimated amount of Rs. 6,000,000 was done.

The fallen trees represented a grave menace to the whole district as affording cover and breeding ground for beetles and other pests.

At first the Government refused to make any grant from the revenue to assist the sufferers in the destruction of such trees, but, in response to the strenuous representations of the planters concerned, cordially backed by your acting M.L.C. (Mr. W. D. Gibbon), the sum of Rs. 100,000 was ultimately voted for this purpose.

Insect Pests.

Through the courtesy of Mr. E. E. Green your Committee report that no new or startling tea pests have attracted special attention during the year.

Tortrix, though still somewhat troublesome in some of the upcountry districts, has not assumed the serious condition that prevailed in Maskeliya two years ago.

Shot-hole borer remains our most important tea pest. Mr. Tyler's scorching method is a new departure in the treatment of the borer, and gives promise of good results.

Tea mites are always more or less prevalent during the dry season, but are readily amenable to the sulphur treatment.

There have been a few cases of defoliation by 'Red Slug' and 'Nettle Grub,' but not of a wide-spread or serious character.

Helopeltis has been rather more troublesome than usual in parts of the Kelani Valley.

The disastrous cyclone in the Batticaloa district has been followed by an alarming increase in the numbers of the red palm-weevil. Measures have been taken to check further increase by new regulations under the Pests Ordinance, insisting upon the destruction of fallen trees.

Rubber still remains exempt from any really dangerous insect pest. It is believed that the presence of the viscid latex in the bark renders the plant practically immune to attack.—*West Indian Bulletin.*

CULTIVATION AND PREPARATION OF JAMAICA GINGER.

By R. J. Miller, Jamaica.

It is now between sixty and seventy years since ginger was introduced to Christiana in Jamaica. There are not many parts of the island where it can be grown, on account of its needs of a cool climate and suitable soil conditions.

The writer has ascertained by inquiries from some of the oldest inhabitants in the district that the root was first brought to Christiana during the time that Mr. Richard Jackson was the attorney for Struan Castle estate, a property near Christiana, between the years 1835 and 1840.

The experiment of growing ginger on this property proved successful, and not long after, some white immigrants, chiefly from England and Ireland, settled in the district for the purpose of cultivating the article. By careful handling and attention, from the time of planting till the cured article was ready for export, they demonstrated the fact that

this part of Jamaica was able to produce an excellent quality of ginger. The position thus easily attained in the market has been maintained by our ginger up to the present time, for it is now some of the best obtainable.

About 1840, the price of ginger from Jamaica gradually rose in the London market till it fetched as high as 180s. per cwt. This high price resulted in a great increase of the cultivation in and around the district. Many who had little or no experience in ginger cultivation planted it, prompted to do so by the high price, and a great deal of very inferior ginger found its way into the market. A fall of prices has been the result, but, even now, the finest product commands good prices.

It was the general opinion at first that ginger required fresh or virgin soil in order to produce the best results. The consequence was that year by year valuable timber plants were cut down, and large areas opened up for its cultivation. During the governorship of Sir Henry Blake, he visited this district and rode over the greater portion of the devastated country. He expressed the opinion that all this devastation was not necessary and that ginger could be successfully cultivated in properly tilled and manured lands.

Acting upon this suggestion, and through the advice of the Agricultural Society, experiments in growing ginger on manured land were commenced.

They were a decided success, and so proved the hitherto disbelieved fact that ginger could be cultivated around the houses of the peasantry.

An experiment was made a few years ago to grow ginger on a much larger scale than had hitherto been attempted—and to dry by artificial heat so as not to have to depend exclusively on the heat of the sun. The venture proved a success at first, but it would appear that just at that time the production exceeded the demand and the price fell.

The present outlook is not particularly hopeful, for unless the cultivation of the article will yield, at least, 40s. per 100 lb. to the grower for the best quality, the crop will become shorter year by year.

Another factor to be considered is that bananas grow freely on the ginger soil, and when it is considered how much less labour a crop of bananas takes than ginger, it will be seen at once that the one will be, in any case, preferred to the other. During the last two or three years the cultivation of bananas around Christiana has increased to a remarkable extent, and lands are becoming

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covered with the fruit which finds such a ready market in Great Britain and America. It is also understood that mountain-grown bananas compare favourably in flavour, etc., with those raised on the lowlands.

The small crop of 1905-6 seems to be a forecast of what is undoubtedly coming, for, as the cost of cultivating and curing ginger is great and laborious, many, finding that the prices obtained do not sufficiently warrant their continuing the cultivation, have turned their attention to other and more promising sources of income.

PREPARATION OF GINGER.

It may be interesting to some of the members of the Conference, who are not familiar with the preparation of ginger, to learn something of the method by which it is prepared for the market. It will be seen what a tedious process it is, one involving constant care for days, and dependent also on fine and bright sunshine all the time.

The plants, which are the small parts of the root not fit for peeling, are put in the ground from April to June of each year, and these are ready for harvesting from the following January to March. A second crop, called the ratoon crop, is reaped again in December without further planting.

Ratoon ginger is usually somewhat thinner than the first crop ginger, but for all practical purposes it is as good.

There are two kinds of ginger in this district, 'blue' and 'yellow.' The 'blue' was the first kind established, but gave way to the 'yellow,' which, however, does not seem to be preferred by merchants.

The root is dug up by the hoe, and then requires to be peeled—an operation which needs a skill only attained by considerable practice. The peeling consists in removing the outer skin with as little of the ginger as possible. The peeling of ginger is not easy, as will be seen by observing the root, and a particular narrow-bladed knife has to be used. To peel most effectively, the knife must be very sharp.

Ginger peeling is almost entirely done by women, many of whom employ their children to do the easier part of the work, that is, the sides of the roots. Thus from a very early age, the peeler is educated in the art, and during the ginger season many women, attracted by the work, flock into the district from all parts of the parish.

The peeling of ginger cannot be said to be hard labour, but it becomes sufficiently fatiguing for the hands if long

continued. A good peeler should be able to peel 50 lb. of green ginger in a day, which when dried would weigh about 18 lb., and for this they are paid 1s.

After being peeled, the ginger is washed. It is then laid out to dry on small mats made from the mountain thatch, which has been found to be the best medium for drying ginger, for a certain amount of evaporation takes place on the under side as well as on the upper.

While being dried in this way, the ginger has to be turned over by hands piece by piece, at least once on the first day. This drying process occupies five to six days, according to the strength of the sun,

After being dried, it has to be bleeched by washing, in order to give it the white appearance. After this it receives two days' drying before being packed for export.

It was formally shipped in large casks, of a capacity of 4 to 5 barrels; but now it is shipped in barrels, and the common quality in bags.—*West Indian Bulletin.*

A POSSIBLE MARKET FOR CALABASH GOURDS.

The Colonial Botanist, Mr. F. M. Bailey, has received from Messrs. Field and Villars, of the Australian Calabash Pipe Factory, Pitt Street, Sydney, two calabash pipe bowls—one, silver-mounted, ready for use; and one prepared, ready for mounting—also a pipe head made of the seed capsule of one of the gum-trees (*Eucalyptus mineata*); the latter, however, is, as the makers say, not likely to come into favour with the public, being too clumsy. The calabash pipe is, on the contrary, very handsome, looking much like a meerschaum, and equally light. The firm named announce that they will buy large quantities of these little gourds at £12 per 1,000, f.o.b. Brisbane. A very small plot of ground will grow thousands of them, and, on good soil, they thrive as well as pumpkins, melons, or chokos in Queensland. They must be without flaw, and, when ripe, exposed to the sun until they bleach to a very light-yellow colour. Whilst growing, the gourd, when possible, must be placed with the large end downwards, in order to secure the shape. After being cut, and during the bleaching process, care must be taken not to leave them exposed to rain or dew. Before shipping the gourds, the thick end must be cut off, as it is not used. If growers send three or four gourds to Sydney, they will there be cut as required, and returned to the sender as a guide. Only the stem portion is used for pipe bowls. At present these gourds are imported from South Africa. Queensland farmers, gardeners, and others could easily capture the trade, and, seeing with what little trouble the gourds can be produced in large quantities, the price of £12 per 1,000 should be very remunerative. Mr. Bailey is of opinion that this kind of gourd will do best, for pipe-making purposes at least, on the table-land from Toowoomba to Warwick. The warmer coast land, he thinks, would produce gourds too large for the purpose required.

[The gourd referred to is *Lagenaria vulgaris*, generally known as the bottle gourd.—Ed.]

NOTES AND QUERIES.

By C. Drieberg.

N. W.—The information you have received is not correct. The Nitro-Bacterine advertised in the *Review of Reviews* will not do for any and every crop, and will not do for paddy. The December, 1907, number of that publication distinctly states that the Nitro-Bacterine for clover is different from that for peas, so that in the case even of different leguminous crops the preparation is different. "At present," to quote from the paper, "we have only discovered the method of applying Nitro-Bacterine to leguminous plants, not to ordinary cereals." It will thus be seen that paddy is out of it altogether.

In view of the above statement it is rather puzzling to find it stated in an advertisement that Nitro-Bacterine has been found to give excellent results when applied to tomatoes and even to roses!

G. de S.—Yes, Casuarina is the same as our "whip tree," the Sinhalese name of which is a literal translation of the popular name. There is nothing secret about its germination; the seed comes up well in a well-prepared nursery bed. The only thing to be careful about is to get good seed. If you are a member of the Society, the Secretary will get it for you. It is astonishing how it flourishes on the sea shore. Those who have visited Madras will recall the hedge along the Marina. The wood is, as you say, extremely hard. I believe it is known as "beef-wood" in Australia, owing to the colour of the timber.

Cotta.—Carbolineum is known to be an excellent dressing for trees and timbers to keep off all kinds of insects, including white ants. Whether it would

do as an application—instead of coal-tar—for the coconut stem disease is a question for decision by Mr. Petch, the Government Mycologist, with whom you should communicate, consulting him at the same time as to the relative merits of coal tar and pine tar, and also what could be the best wash to keep the disease out of healthy trees. As far as I have been able to ascertain, the disease has not been found in India.

P. F.—You should send your samples of Cotton to the Manager of the Spinning and Weaving Co., Wellawatte. Mr. Whitehead is at present out of the Island, but you will see from the last Progress Report that he anticipates a good demand for Ceylon cotton if it could be had in quantity. Of late, to judge from applications for seed, there have been some fairly big areas put under cotton.

A. D.—You may be sure that the improvement of our local fruits will be taken up by the new Assistant Director of the Botanical Department, as plant breeding is one of his special lines of work.

G. P.—I fear there are few—if any—people who now cultivate ground-nuts. It is a crop that does best in dry districts. In Burmah, where it has been introduced quite lately, it has caught on wonderfully, and is spoken of as a very remunerative crop. The experience of many people who took up the cultivation in Ceylon some years ago is rather different. There is no doubt, however, that it will thrive in many parts of the Island as a villager's crop—not as a planter's crop. In the Pondicherry district the leading exporters of ground-nuts find it worth their while to advance money against crops, to induce the ryots to take up the cultivation.

B. J.—The Cape Gooseberry does not do well in the low country. I have seen good crops raised near Matale from seeds brought over from Australia. The plant does well in Nuwara Eliya, but there is no very large out-put of fruit so far as I know. The Cape gooseberry is very plentiful in the Calcutta market in season. It makes a very fine jam.

BOARD OF AGRICULTURE.

MINUTES OF THE 38TH MEETING.

The 38th Meeting of the Board of Agriculture was held at the Council Chamber at 12 noon on Monday, the 3rd February, 1908.

The Hon'ble Mr. H. L. Crawford, C.M.G., Controller of Revenue, presided.

There were also present:—The Hon'ble Messrs. H. W. Brodhurst, P. D. Warren, John Ferguson, C.M.G., Sir Solomon Dias Bandaranaike, C.M.G., Messrs. J. Harward, C. P. Hayley, W. A. de Silva, F. L. Daniel, A. N. Galbraith, E. E. Green, W. Dunuwille Disava, Dr. H. M. Fernando; and (as visitors) Messrs. A. P. Waldock, J. D. Vanderstraaten, Alex. Perera, N. D. Jayasuriya, and the Secretary.

BUSINESS.

(1) Minutes of the previous meeting held on the 2nd December, 1907, were read and confirmed.

(2) Progress Report No. 37 was presented and adopted.

(3) A statement showing the apportionment of votes under the Government Grant for 1908 was submitted by the Secretary, with the explanatory notes thereon. It was decided to refer the statement to the Finance Committee for report and bring it up at the next meeting.

(4) Statements of expenditure incurred during December, 1907 (to end of the year) and during January, 1908, were tabled.

(5) In the absence of Mr. M. Kelway Bamber, who has left for England, the Secretary read the Government Agricultural Chemist's reports on the question of adopting a new test for Citronella oil with a view to preventing its adulteration. Mr. C. P. Hayley, representing the merchants dealing in the oil, went fully into the subject and submitted that it was not necessary to introduce any new test, as Schimmel's test answered all the requirements of the trade. Dr. Fernando supported this view. When the question was put to the Board, it was unanimously agreed that no new test was necessary.

(6) The Secretary read a "Note on Recent Researches into the cause of Infertility in Soils" in place of the paper by the Hon'ble Mr. John Ferguson on "The Possibilities of the Ceylon Agricultural Society" (postponed for the next meeting). The Hon. Mr. Ferguson and Sir Solmon Dias Bandaranaike offered remarks.

The Government Entomologist exhibited samples of eri silk cloth locally woven. Mr. Harward and the Secretary spoke as to the possibilities of the silk industry, and the Chairman thought that the teacher of the Mediwaka School, from whom the samples were received, deserved all encouragement.

AGRICULTURAL SOCIETY'S PROGRESS REPORT NO. 37.

Membership—The following members have joined the Society since the last meeting held on December 2:—Johnson Lourensz, Sam. Munasinghe, M. L. M. M. Ismail, Superintendent of Labugama estate, Aitken, Spence & Co., T. J. Wilson, Secretary of the Nizam Club (Hyderabad), T. G. Elliott, Campbell Dudley, Superintendents of Glen Alpin, Hindagala, and Narangala, Cecil A. Hall-Hall, A. J. Austin Dickson, P. D. Mack, and W. M. de Alwis.

The Society began the year 1907 with a membership of 1,101. During that year 84 members joined, 34 resigned, 21 suspended membership owing to their leaving the Island, while the Society was unfortunate enough to lose 12 others by death.

In December last a combined meeting of the Finance and Education & Publications Committees, with the general approval of the members of the Board, decided to increase the rate of subscription payable by members from Rs. 5 to Rs. 8 per annum, and a circular notifying this fact was duly addressed to all members of the Society, 55 members resigned on the ground that they disapproved of the enhanced rate, and 11 owing to their inability to pay the higher subscription. The total resignations attributable directly or indirectly to the raising of the subscription was 96.

Communication from Sir Henry Blake.—The Secretary has received a letter from Sir Henry Blake forwarding the last report of the Jamaica Agricultural Society, and expressing it as his opinion that "School Gardens and Agricultural Instructors are the two most valuable factors in reaching the agricultural masses. The result in Jamaica is an assurance that with perseverance and the employment of co-operative societies the Ceylon Agricultural Society will in the future fulfil my expectations."

Branch Societies.—The *Galle Gangaboda Pattu Branch* has arranged to plant up the Gansabhawa grounds with a collection of fruit trees. At a recent meeting it was agreed "that a manure depôt for 1908 be opened against the commencement of the *yala* harvest." Arrangements are being made to supply the fruit plants; and Messrs. Freudenberg & Co., as last year, have kindly consented to allow the manure at special rates.

A meeting of the *Trincomalee Branch* was held on January 4, when the outlines of a scheme for the formation of an Agricultural Co-operative Bank were considered. After discussing the various aspects of the project, it was resolved "that in the opinion of the meeting it is desirable that steps should be taken towards the formation of an Agricultural Bank for the District of Trincomalee." The starting capital was fixed at Rs. 500, and a Committee consisting of seven members, with the Assistant Government Agent as Chairman, was appointed. It was further resolved that a Market Show be held on March 7 next.

Telijjawila Seed Bank and Co-operative Credit Fund.—This bank started work in 1906 by distributing seed paddy; but it was found difficult to handle the paddy owing to the absence of store accommodation, deterioration, and the want of labour. It was therefore decided to lend money to the cultivator to buy his seed, the loan to be returned in cash instead of in kind. The funds in hand (with any additional sum that may be available from subscription for 1908) are about to be issued in the following divisions:—Akuressa, Marambe, Hallala, Nankawa, Pahalawalakade, Kadykanna, Paraduwa, and Kananke.

The Branch Society has offered prizes under the following heads:—Rs. 100 for transplanting in paddy; Rs. 150 in six prizes for the best vegetable gardens—prizes to range from Rs. 50 to Rs. 10—the gardens to be not less than half an acre in extent. The prizes will be given away on July 15, probably by the Assistant Government Agent. English vegetable seeds will be supplied free to the competitors.

The Katunayake Branch.—As the result of a meeting of this branch held on December 13, it was decided to erect a public market at the Katunayake road junction, the Chairman, Mr. A. E. Rajapakse, Mudaliyar, undertaking to do this at his expense. Members have agreed to take up the cultivation of vegetable and other products. Copies of the "Govikam Sangarawa" for a year will be given to the school at Andiambalama for the use of the boys, who will be given prizes on the result of an examination on general agricultural knowledge derived from reading the magazine. The use of the Planet Junior plough will be demonstrated in order to induce villagers to adopt better implements. Inquiry will be made as to the best means of destroying the paddy fly. A census of the coconut trees affected with the stem disease will be made at once. The system of green manuring will be encouraged. Application will be made for the appointment of a Vel-vidane for supervising work in connection with paddy cultivation.

A meeting of the *Wellaboda Pattu* (Galle) Branch Working Committee was held on December 7, when the following programme was adopted for 1907:—Continuation of experimental fruit garden; distribution of vegetable seeds among villagers; intoduction of new yams; distribution of prizes for vegetable gardens; holding of a Cattle Show and Fair; the encouragement of the cultivation of neglected lands under the new Irrigation Ordinance; the introduction and distribution of varieties of paddy from other districts.

At a meeting of the *Hambantota* Branch, held on December 7, it was decided to offer a medal costing Rs. 5 for the best vegetable garden, to be inspected on February 11.

The amalgamation of the *Gangaboda Pattu* and *Wellaboda Pattu* (Matara) Branches with the Matara Society reduces the number of the Branch Societies by two.

Coconuts.—The following extracts from the report of the Director of Public Gardens, Jamaica, are suggestive, and should prove of interest to local cultivators:—"A coconut tree at Thompson Town in Clarendon, which had never been known to yield good fruit on account of the nuts splitting, was sprayed with Bordeaux mixture, and good water coconuts have since been cut from the tree, which was, at the time of spraying, anywhere from 40 to 50 years old. I attributed the dropping to fungoid growth at the base of the nuts, and sprayed with Bordeaux mixture accordingly.

"I gave samples of nuts affected in this way to Professor Johnston, who said it was undoubtedly a fungoid disease, and promised to furnish me with further particulars.

"The tarring of the trees at Orange for weevils is quite successful; after an interval of nearly twelve months only one little appearance of borer could be discerned, and the improvement in the treated trees is little short of marvellous.

"The dropping of leaves and bunches reported by Mr. Taylor at Blue Hole was dealt with by applying sulphate of iron at the roots of ten trees, eight of which received ½ lb. sulphate of iron each, two receiving 1 lb. sulphate of iron each. From none of the trees treated had Mr. Taylor picked a ripe nut. On the occasion of the visit of myself and Professor Johnston on March 18 all the treated trees were holding nuts, and those which had received the larger dose had ceased to drop entirely. Professor J. R. Johnston said that the cooonut trees at Blue Hole were the finest that he had ever seen. Mr. Taylor showed us trees, not yet seven years of age, which had over 200 nuts each."

Visit of the Organizing Vice-President and Secretary to Negombo.—On December 20 Dr. Willis and the Secretary visited Negombo District to verify reports concerning the spread of the coconut stem disease in the district. It was found that the disease had affected a large number of palms, some of which had been actually killed out. Instructions were given for the treatment of the disease as advised by Mr. Petch, Government Mycologist, and copies of a circular in English (by Mr. Petch) and a summarized Sinhalese leaflet were distributed. Mr. A. E. Rajapakse, Mudaliyar, Chairman of the Katunayake Branch, was of great assistance to the officials, who were also met by Mr. G. T. Nicholas and Mr. J. D. Vanderstraaten. Mr. Rajapakse is using his influence with owners of gardens to get the treatment of the disease properly carried out. If other Branch Societies followed the example of Katunayake, the result will prove their utility as agencies for conserving the interests of the agriculturist.

A Tool for Cutting out Diseased Tissue.—The use of chisel and hammer in cutting out diseased tissue is general, and it is difficult to improve on the thorough work done by this means; but in many cases much time and labour is taken up in removing small sections which a tool that could be wielded with one hand might do as well. Specimens of the latter could be seen at this office, and should prove useful in cases of early infection.

Agricultural Instructors.—Inspection work is being done by these officers of the Society. Mr. Wickramaratne, who was sent round the villages between Colombo and Negombo, reports that the disease is very widespread, though villagers do not seem to recognize it as of any importance, and hence take no steps to eradicate it. His itinerary included Telengapatha, Kerawalapitiya, Hendala, Uswetakeiyawa, Bopitiya, Pamunugama, Tudella, Ja-ela, Katunayaka, and intermediate hamlets. The disease was found to exist in all the places visited. He explained the nature of the disease the treatment to be followed, and distributed leaflets in Sinhalese.

Among the remedies reported in some quarters to be effectual in arresting the disease are (1) a dressing of sea sand round the trees, (2) tapping for toddy, (3) application of coal cinders. Mr. L. A. D. Silva, Agricultural Instructor, who visited the Ambalangoda District, reports that the disease has not spread to any great extent in that quarter.

Tobacco.— Messrs. Freudenberg & Co. have submitted the following report from a German firm on a sample of tobacco received from Trincomalee :—"There is a chance of doing business in Ceylon leaf, which seems suitable for the German, Dutch, Swedish, and Norwegian markets. However, quality should be improved. If shipped to Germany the stalks should be taken off the leaves, as manufacturers would not otherwise buy the leaf owing to the high import duty on manufactured tobacco, as duty would have to be paid also on the weight of the stalks. Duty here amounts to 85 marks per 100 kilos on raw tobacco. Packing may be done in the following manner :—Pack and press in bales, the leaves laid out together, but not each individual leaf spread out, *i.e.*, the leaves not squeezed together in bunches, but as samples No. 1, 2, 3 you sent us. To be packed in bales, and to be sewn up in linen or jute hessian. Large shipments would have to be graded by experts according to length and quality of the leaves. One of the chief points is that the tobacco when lit must burn, *i.e.*, must continue to burn. Ceylon tobacco when lit gives a bright flame, but then goes out. The reasons herefor may be various. The soil or the manure applied may contain too much saltpetre, or the soil may be orginally too rich, or may have been manured too heavily. For the manufacture of pipe tobacco your grade 2 may be suitable, if the rib down the centre of the leaf were thinner and would burn easily. Colour does not matter in this case. All three qualities could be used for the inside of cigars. The leaf would have to be much shorter and burn more readily. For the outer covering the present size of the leaf would do; the colour should be either brown and free from spots, or a bright yellow. In our opinion the soil used for growing the tobacco, of which you sent us samples, is too rich; we would advise you to use more sandy soil and plant the tobacco plants closely together."

Mr. M. Kelway Bamber, commenting on this report, writes : "The recent sale of leaf from Maha Illuppalama was unsatisfactory, although the leaf was well reported upon. I do not think Ceylon tobacco soils can be described as too rich, but in Jaffna, where it is almost sand, a large proportion of cattle and goat manure is mixed with the soil, and would no doubt cause a rank growth and coarse quality. If a foreign market can be found for the leaf, tobacco would be a most satisfactory crop for the North-Central Province. I will make inquiries about this when at home."

Cotton and Transplanting in Paddy at Marawila.—Mr. W. S, Goonewardene of Marawila reports that he is making a trial with cotton cultivation and also paddy cultivation by transplanting.

Rubber Experiment in Puttalam.—The experiment in rubber cultivation under Maha Uswewa has not proved a success, Besides having to fight against the drought, the plants were damaged by deer and monkeys, which could not have been kept out by a barbed wire fence. Dr. Willis, commenting on the report on the experiment, says : "Rubber wants particular care when young, especially in a dry place like Puttalam."

Co-operative Central Market.– Further trials were made in selling produce at the Edinburgh market in connection with the proposed Central Agency. The prices obtained at the stall compare favourably with the rates obtainable in outstations, but what hinders ready participation in the scheme is the cost of rail freight, which prevents many from sending goods to Colombo, and makes the grower satisfied with the lower local prices obtained without risk. If only Branch Societies will arrange to send down goods in quantity on the same day, the incidental expenses on the handling of consignments will be much reduced on each consignment, while the Railway Department will probably be inclined to provide special vans for carrying the produce at reduced rates. The Secretary of the Dumbara Branch reporting on a recent sale remarks : "The railway rates, which are considered too high, act as a deterrent to those who may otherwise send their produce to the metropolis. If with the assistance of other Branch Societies sales are held regularly, the local Society can contribute not only vegetables and fruits, but also kapok, Dumbara mats, lacquer work, &c."

In the sale held in the third week in December the produce included vegetables and limes from Dumbara, and poultry, eggs, and oranges from Vavuniya.

Sericulture.—Following is a report by a Manchester firm on samples of eri cocoons submitted to them :—"We have made inquiries with reference to the demand in this cauntry for cocoons like the samples that you sent to us, and find that at the present time these are being regularly purchased by a firm in Manchester, and re-sold by them at such a price that they cannot pay much more than 1s. per pound for them. As your Society is buying at 2s. per pound weight, there seems a great disparity between the prices. We regret, therefore, that we are unable to obtain more favourable terms for the cocoons, but if you should

find at any time that you are able to offer the cocoons at anything near this price we shall be glad to again take up the matter."

Cotton.—The selected Sea Island and Egyptain cotton seed received from the British Cotton Growing Association has been in great demand, and some of the orders were for planting as much as 100 acres. A quantity (chiefly of Sea Island) is still available.

Mr. Joseph Whitehead, who is on a visit to England, writes on November 14: "I have been among cotton buyers here (Manchester), and if you can get the growers to send us their cotton I can sell any amount. It can be ginned and baled at Mr. de Soysa's mills in Slave Island. The consumers here are wanting it badly, and will give from 6d. to 1s. per pound according to quality." Writing again on December 20, Mr. Whitehead reports: "There is very good demand for Ceylon cotton, and any amount can be sold; supplies are urgently wanted. Kapok lint and seed, cacao, ground-nuts, and cinnamon chips could also be disposed of to advantage. Any one sending samples will get offers direct from the firm (whose name and address I enclose), saving middleman's charges. I had 4½d. per pound offered for clean kapok and £7 per ton for the seed."

Lemon Grass Oil.—Messrs. Bohringer reporting on the oil distilled from lemon grass grown at the Model Farm state that 30 cwt. gave 5 lb. 1½ oz. oil, containing 75 per cent. citral. They value the oil, which they describe as of normal composition, at 3¼d. to 3½d. per oz.

Japanese Udo.—This is the name given to a species of Aralia (*A. cordata*) used in Japan as a vegetable. The shavings of the blanched shoots served with a French dressing make an excellent salad. Mr. David Fairchild, Agricultural Explorer to U. S. A. Department of Agriculture, referring to this plant as one of his "finds," mentions that the salad has a distinct flavour of its own, a crispness that is unusual, and a pretty silvery appearance. Shoots of Udo obtained from Japan have started growing in the Government Stock Garden, and cuttings will in course of time be available for distribution to members.

Casuarina.—A supply of Casuarina seed has been obtained from India with the object of growing it experimentally on coastal areas. The Assistant Government Agent of Chilaw has undertaken the first experiment. In South India it is grown on sandy tracts as a fuel tree, and its cultivation is remunerative.

Transplanting and Manuring of Paddy.—Mr. W. G. Perkins of the Irrigation Department is interesting himself in the improvement of paddy cultivation by means of transplanting and manuring in Minneri district. The help of officers of the Irrigation Department, who have special opportunities for such work, would be invaluable.

Lemon-scented Iron Bark.—A small quantity of the lemon-scented iron bark seed (*Eucalyptus staigeriana*) was received through the courtesy of the Department of Agriculture and Stock, Brisbane, and put down in the Stock Garden.

Green Manure for Jaffna Peninsula.—Communication with the railway authorities on the subject of facilities for the conveyance of this material from the main land to the peninsula is in progress. The concession asked for, if granted, will prove a great boon to cultivators, who cannot afford to pay the present rate of freight.

Castration of Cattle.—The Government Veterinary Surgeon reports that—according to reports received up to December 23—781 head of cattle belonging to 605 owners have been operated upon by the officers of his Department at 56 centres, and that 41 men have been trained locally for the work during 1907.

Grafted Sapodilla Plants.—The grafted sapodilla plants from Calcutta ordered by certain members were received early in January. The supply is exhausted, but orders can be booked for April planting.

Publications.—Copies of the Government Mycologist's report on coconut stem disease and a Sinhalese translation of the same have been freely distributed.

The following leaflets are in course of preparation:—Paddy Cultivation Notes; Tobacco; and Silo Making.

It is proposed to effect certain improvements in the "Tropical Agriculturist and Magazine of the Ceylon Agricultural Society" from February. The publication will contain more matter, and will also be more varied in character.

The following is a list of leaflets published by the Society, copies of which can be had by members, free of charge, on application to the Secretary. In cases where vernacular copies are available, the fact is signified by S. for Sinhalese, T. for Tamil, and in cases of leaflets out of print by o. p.:—

1. Agriculture in Tamil Districts.—o. p.
2. Caterpillar Pest in Paddy Fields.—S., T.
3. Castration of Cattle (mode of operation).—S., T.
4. Canker (Nectria) of Para Rubber (*Heava Brasiliensis*).
5. Ground Nuts.—S., T.

6. A Note on Chili Cultivation.—S., T.
7. Rules to Govern the Management of Agricultural Shows.
8. Yams (Dioscoreas).—S., T.
9. A Note on Onion Cultivation.—S., T.
10. Prevention of Plant Diseases by Spraying.—S.
11. Cotton Experiment Stations, North-Central Province, in 1903.
12. Castration of Cattle (Instruments and Dressings).
13. Kiushu, of Japanese Paddy.—S., T.
14. On the Importance of submitting Specimens when reporting Injury from Insect Pests.—S., T.
15. Hints on Cotton Cultivation.—S., T.
16. Useful Hints to Growers of Castor Oil (Eri) Silk Worms.—(S.—o. p.)
17. Where Rubber will grow.—S., T., E.—o. p.)
18. Agri-Horticultural Shows (Instructions for Forwarding and Arranging Exhibits)—S., T.
19. Shade Trees, their Importance, Instructions for Planting, &c.—S., T.
20. Dumbara Tobacco.—S.
21. Use of Salt for Manure.—S., T.
22. Manioca Cultivation.—S., T.
23. Dhall (its Cultivation.—S., T.
24. Method of taking Samples of Soil for Analysis.—T. (S.—o. p.)
25. Transplanting in Paddy Cultivation.—S.
26. Bud Rot of the Coconut Palm.—S.
27. The Improvement of Local Races of Plants.—S.
28. A Simple Preventive against Malaria —S., T.
29. The Use and Objects of Agricultural Societies.
30. West Indian Yams.—S.
31. Castration of Cattle during 1906 (Annual Report).

31*a*. Report on a Visit to India.

32. Notes on a Tour in the Southern Province.
33. The Conservation of Soil Moisture.—S.
34. Rotation of Crops on Chena Land.—S., T.
35. The Stem Disease on Coconuts (Royal Botanic Gardens, Circular).—S.
36. Diseases in Tobacco in Dumbara (Royal Botanic Gardens, Circular.—S., T.

Colombo, February 3, 1903.

C. DRIEBERG, Secretary.

THE SUPPLEMENT TO THE

Tropical Agriculturist and Magazine of the C. A. S.

No. 2.] FEBRUARY, 1908. [Vol. II.

TEA IN 1907.

MESSRS. McMEEKIN & CO.'S ANNUAL REPORT.

The year was one which presented many features of interest to the various sections of traders connected with tea business. The dominant influence was the continued development throughout most tea-using countries, in the displacing of other growths by Indian and Ceylon Teas. The consequent increase in the world's consumption of those rendered the production of them apparently inadequate to meet the demand, and led to a continuance, more or less steady throughout the year, of the advance in the average of prices which commenced during 1906.

Producers.

The conditions in general for those interested in the profits of production have greatly improved, and the most obvious index of the improvement is the selling value of the shares in the principal Tea Companies. The calculations of Mr. Geo. Seton as to 170 companies representative of India and Ceylon, show that the shares and debentures of same were at about the lowest point (say September, 1902) worth £12,100,000, but their value at 1st November, 1907, was £21,600,000. The par value of the same securities is £19,000,000, and it is frequently assumed that the figure represents the cost of the properties. It merely represents the cost of their investments to shareholders who purchased at par. The varying capital value per acre shows that certain estates have cost much more to make than others or that the inflation of capital at the time of formation has in some cases been considerable. Many of the properties included in companies changed hands frequently at ever-increasing valuations, and promoters' profits and costs of flotation went to swell the capital. In a few cases capital lost has been written down. The resident planter managing his own estate will soon be a mere memory, the ownership in most instances now vesting in an absentee proprietary of shareholders. The "poor planter" exists more really than ever he did, however, in the shape of resident managers and assistants who lack the stimulus their predecessors had in the possibility of brilliant results from their individual efforts on their own behalf.

Although a general improvement in results is shown, it is much to be regretted that the producers of high-grade Teas have suffered severely by what approximates to a dead level of uniformity in price. The old subtle distinctions of grade and quality seem to be abandoned in the scramble to get merely what is lowest in price, and little encouragement is given to the production of superior tea. The demand will probably always be equal to taking off choice quality Darjeelings when produced, but the fine astringent Assams of former years, which were used to fortify weaker growths in blends, are unlikely under modern conditions to be so much required. The subject of turning the popular taste on to *goodness* rather than *cheapness* should weigh with the producers, and surplus profits might be devoted to a quality crusade with more result than has followed other less desirable expenditure.

Distributers.

The year has not been by any means a satisfactory one to the distributers. The large wholesale dealers, who buy in the public auctions for resale in the country, made in many cases serious losses in consequence of the falling prices for everything except common teas. The profits on the latter, which are generally quickly turned over at narrow margins, never at best provide any reserve towards losses. The smaller dealers and independent shopkeepers have found it hard to meet the competition of the great multiple shop companies. Those who generally sell other goods besides tea have seen fit to cut the latter at unremunerative rates with which the dealers in tea alone could only compete by making serious sacrifices. The higher prices current entailed greater capital requirements, while yielding smaller profits, and in the closing months

the 7 per cent. bank rate coming suddenly at the busiest period of the year contributed to make results worse. Unless there is a general recognition that the retail prices of all grades of Tea are to include a fare allowance for the risks and expenses of business and a reasonable profit in addition, some of the middlemen and many of the small retailers will be forced out of the trade.

Consumers.

While the producers got 1d. per lb. on the average in London over the price of 1905, and the Chancellor of the Exchequer 1d. per lb. less than in most of that year, the consumer was as carefully as possible prevented from recognising that any changes had taken place. The ever-foolish distributer benevolently kept the balance even. The struggle to continue offering a retail Tea at 1s. per lb. continued to the end of the year. In the lower grades the quality was probably the poorest that could be produced by sweeping up the remnants from all the great Tea ports of the world, but the relative fall in the better grades enabled much Tea of good type and character to be retailed at prices hitherto unknown.

The rate of consumption per person (6·21 lb per annum) is the highest on record for the United Kingdom, and it is exceeded only in the Commonwealth of Australia, the Dominion of New Zealand, and in the somewhat doubtful case of Tibet.

The marked prosperity of the working classes especially, and of the community generally throughout most of the year, doubtless accounts for the great strength of the demand, and it is satisfactory to note that the increase in the home consumption has been accompanied by similiar increase in the use of cocoa and coffee. It is not so satisfactory, however, to record that there have been increases also in the amount of importation of foreign wines and spirits and in the home duties collected from spirits, all of which had been for some years previously apparently diminishing in consumption.

Indian Tea.

The displacement of London as the centre of distribution continues with tea as with many other classes of goods, and although the total importations into the London warehouses declined only about 10 million lb. as compared wit the previous year, the offerings there at pul lic auction were very much less, being in fact the lowest at any time during the last six year Part of the falling off arises from the fact that many teas are bought "ex ship" or imported by blenders for immediate use, and that many now go direct upon arrival to country bonds for distribution from there. The largest factor in the diminution of quantity, however, has been the fact that some 60,000 packages more had up till Christmas been sold in the Calcutta auction than were disposed of there in the same part of the previous season. The strength of the Russian demand (which has largely been transferred from the London market to those of Calcutta and Colombo) has now become the determining factor in price, and it is somewhat surprising that more teas have not been offered abroad rather than in London. The Calcutta market has during the year shown an improvement in value of about 27 per cent. on the average price for 1906, while the average price in London advanced only ¾d. per lb. or about 10 per cent. It is unfortunate for the shareholdera in certain Companies which seem committed (possibly by arrangements with warehouse-keepers, brokers and others) to ship all their Tea to London, that the full benefit cannot be obtained of the alternative market. Were the Calcutta market more fully supplied, it is probable that it would be supported even better than now, as many English buyers prefer the more practical conditions of buying there and importing to their own warehouses, without the necessity of incurring the costs that fall on all teas offered at public auction in London. They are also able to buy in Calcutta on the more reasonable basis of bids advancing by 1-12d. per per lb., instead of as in London by ¼d. per lb.

It will be seen that although the imports to the United Kingdom were 171,390,000 lb. or a decrease of about 12½ million lb on the previous year, the deliveries for home consumption and foreign trade were some 7 million lb in excess of the importations, being almost up to the figure of the previous year. This is most satisfactory when it is held in rememberance that during the new season up till Christmas the Russian buyers took direct from Calcutta about 8½ million lb more than the very large total they had taken in the previous year. The yield for the season seems to have been a most uncertain one, some estate stopping early and giving short crops, others holding on and giving large increases, but it appears probable that it will wind up with a slight deficiency upon the record crop of 1906. Dooars is the only district in which there was a general short outturn. The quality gene-

rally has been fairly good, without being in any way outstanding.

CEYLON TEA.

Coming after a year in which there had been a set-back in yield it was natural to expect that 1907 would show some increase. The figure of increase, however (say about 13 million lb.), is considerably beyond any expectations formed earlier in the season. It has been made up in a somewhat eccentric way, similar to the yield from India, as many companies show deficiencies while others show considerable increases. It is fortunate that the large development was coincident with an Indian yield inclined to be retrograde, so that it has been found possible to dispose of the heavy production at prices which in Colombo, as well as in London, tended generally throughout the year to a gradual but certain advance in level.

There is no evidence yet that rubber is affecting production, or that the higher costs of labour and labour difficulties are tending to restrict same. As more rubber trees reach the tapping stage, it is possibe the labour difficulty may show itself more definitely, but the recent condition of the market for rubber and the less brilliant prospects for rubber investments, will, no doubt, tend to check extensions. There is now shown some disposition to make extensions in tea where suitable land can be found. It will, however, be many years before the crop from such can come into competition with the existing volume of supply. It will be seen that the importations into the United Kingdom were only slightly in excess of those for 1906, but that there was a very considerable falling off in both the duty-paid consumption and the exportation, the use of Ceylon tea having dropped back materially in the home trade during the last two years.

JAVA TEA.

The island of Java continues to make moderate progress in yield, and the Tea grown there is now of much more general interest to Tea distributors because of the improvement in quality and manufacture. A few of the estates are, in their produce, quite equal in character to corresponding estates in India and Ceylon. There is no doubt that if capital could be found to develop more rapidly the Tea possibilities of the island it would become a most formidale competitor to the other growths. The consumption in Holland, to which the great bulk of the production is sent, has remained fairly stationary for several years, rendering it more than ever necessary to re-ship all excess to Great Britain. Some of the London tea brokers, whose business purview is limited by the horizon of Mincing Lane, record a falling off in the volume of Java business, but the statistics herewith will show how gradually but surely this Tea is establishing itself in consumption within the United Kingdom; indeed the competition of Java tea sold in the auctions of Amsterdam and delivered at low rates of freight to various outports in the United Kingdom, is one of the most severe which London tea dealers have to meet and is having a serious effect upon the prices that can be paid for Indian and Ceylon teas to sell in competition. Even the competition of Russian buyers for Java teas (which are free from the special discriminating surtax that Russia put upon Indian and Ceylon teas from London) has now been transferred to a large extent from the London to the Amsterdam market. The exports from London of Java tea have consequently declined materially.

CHINA TEA.

There was during the year a very considerable development in the home use of China teas, and the improved aspect of the statistics for those has been made much of by the specialist China dealers who have been so successful during the last few years in obtaining a great deal of judiciously worked advertising, frequently at no cost whatever. A close examination into the particular kinds of China tea that have gone to make up the increase in the deliveries indicates, however, that the increase is not in the pure high-class teas that the consumer is urged to drink for the benefit of his digestive or nervous organisation. The obvious explanation of the large increase is that blenders have found it necessary to use the very lowest priced stuff obtainable in order to reduce costs to a minimum: inferior China siftings, formerly considered practically unsaleable, have gone into the pot in as large a proportion as the distributer dare use, and certain aspects of the statistics indicate that more China tea of low character has been imported during the year than it has been possible to absorb. The marked unwillingness of the modern consumer to drink anything that betrays a suspicion of the rank flavour of common China tea, is a factor that has to be reckoned with. A limited number of dietetic faddists, influenced by antiquated medical opinions, drink what is called China tea and say that they like it. It is exceedingly probable, however, that much more tea is served

to those who order in the pot under the name of China tea than ever came from the country that is supposed to have produced it. Good, clean, wholesome Indian or Ceylon tea is a safe enough drink for all ordinary consumers. The possibility of extracting from it a large percentage of tannin, which is so often adversely commented upon, is the very factor that recommends it to those accustomed to enjoy and benefit by a really good cup of tea. All tea can be spoilt in the making, and the best that can be said for China tea is that its deficiency in tannin renders the improper use of it less likely to be hurtful but by no means make it a better tea.

Japan Tea.

It may appear superfluous to make reference to Japan tea in a market where practically none of it is used. The general developments, however, of the tea trade throughout the world have had an influence upon the production of Japan tea that has been no small a factor in contributing to the recent rise in the value of other growths. The United States of America and Canada have been hitherto practically the only consumers of Japan Tea, except the Japanese themselves. The force of competition in recent years has so lowered the price obtainable on the American continent for the ordinary growths that (since the Russo-Japanese war and the consequent increase in the cost of labour) the production has been found somewhat unprofitable. The latest published official statistics of the Japanese Empire indicate that since 1896 there has been a diminution by nearly 20 per cent. in the cultivated area under tea. Mulberries have been planted instead as a more profitable crop with less cost for labour. Japan tea thus displaced in Canada and the United States of America has been replaced by Indian and Ceylon.

Tea Statistics for Six Calendar Years.

(Accompanying McMeekin & Co.'s Annual Review of Tea for 1907 :—)

Stock of all kinds in Bond at 31st Dec. ..		124.211,0[illegible]0		129,292,000		134,2[illegible]3,000	
Stock of all kinds in Bond at 31st Dec. ..		125,726,000		112,658,000		108,638,000	
Consumption of all Tea per person of Population within the United Kingdom		lb. 6·21	lb. 6·17	lb. 5·98	lb. 6·00	lb. 6·03	lb. 6·06
Percentage of each kind consumed within the United Kingdom	Indian	59¼%	59%	58%	60½%	59¼%	58½%
	Ceylon	31¾ ,,	34 ,,	34½ ,,	31 ,,	3 ¾ ,,	33½ ,,
	Java	5½ ,,	5 ,,	5 ,,	4¼ ,,	4¼ ,,	[illegible]½ ,,
	China	3½ ,,	2 ,,	2½ ,,	4¼ ,,	5¾ ,,	4½ ,,
		100%	100%	100%	100%	100%	100%

McMeekin & Co.

THE TEA SITUATION IN AMERICA.

Interesting Conclusions from a Study of History and Statistics.

Is America's taste for tea waning? It is a question which has been debated considerably within the past few months and judges of the situation fail to reach any definite conclusion on the issue which meets with the coincidence of other judges. From the view point of one careful student of the situation the average conclusions are based on altogether too narrow grounds, and if a range of years and contemporary history are considered, it will be found that tea is in an extremely strong position in the market. This student, who desires to remain anonymous, writes this paper as follows :—

New York, Dec. 30, 1907.

Editor of *The Journal of Commerce and Commercial Bulletin.*

Sir,—It is frequently stated that there is a falling off in the consumption of tea in the United States, and the imports of the last two years, contrasted with those of the preceding three years, are quoted as a proof of this. This method of argument is based upon the supposition that the importations of tea are identical with the consumption in each year. It only requires this assumption to be stated to expose its falsity, for stocks of tea are carried over from year to year and exports are also a factor. The figures dealt with here are all net, after deducting exports, and the years are fiscal years ending June 30th.

A just estimate of trade conditions today cannot be reached by making comparisons of the importations of isolated years one with another, nor can

THE RECENT HISTORY OF THE TRADE

be ignored, for the following brief survey will show the conditions today to be the immediate outcome of this history. To find a normal period, undisturbed by legislative acts, we have to go back to a time prior to 1897.

"An act to prevent the importation of impure and unwholesome tea" became operative on the 1st of May, 1897. The imposition of an import duty of 10c. per lb. on tea went into effect on the 14th of June, 1898, remained in force to the 31st of December, 1902, and was discontinued on the 1st of January, 1903. The tea trade is only now recovering from

the effects of these disturbing influences, as will be shown by an examination of the facts here dealt with.

The immediate result of the Pure Tea law was a sudden very large increase in the importations of tea, brought in from all available sources in anticipation of the law becoming effective, so that in 1897 the net importations rose to nearly 113,000,000 pounds, the largest figure yet recorded for any single year and equal to an increase of 22 per cent. on the average net importations of the preceding five years (1892 to 1896). Twelve months after this first shock to the trade, or to be exact, on the 14th of June, 1898, the war revenue measures went into effect, including an import duty of 10 cents per pound on tea. This remained as a threatening and disturbing factor to the trade until the 1st of January, 1903, for the war taxes were in their nature of a temporary character, and their withdrawal at an early date was expected. Finally the removal of the tax caused almost as much disturbance to the regular course of business as its imposition had done.

With these facts before us, it becomes clear that that to measure consumption by importation we must go back to a period of stability in the trade conditions and this takes us to a time prior to 1897. Prior to 1897 the trade was in a fairly stable state, and although importations fluctuated with seasonal conditions, the variation was not very great, tending generally to a steady increase to meet the wants of an increasing population. The average net imports for the five years 1892–1896 was about 91,750,000 pounds, and the average of the five preceding years (1887-1891) 83 1-3 million pounds. The population increased by more than 10,000,000 during the ten years 1887-1896, but the average net importations for the two periods of five years each already referred to, viz: 1887-1891 and 1892-1896 gave the same figure per capital, viz.: 1·36 pounds, so it seems probable that this represented fairly closely

THE CONSUMPTION PER CAPITA.

Before proceeding on this assumption, the withdrawals from bond during the period the import duty was levied can be considered, as they throw some light on the invisible supplies held in the country at that time. Withdrawals from bond represented tea that it was absolutely necessary for the trade to have to supplement stocks held free of duty, and the difference between the incidence of withdrawals per capita and 1·36 pounds, represented stocks. We need not pursue this point as it is a moot question whether or not consumption was affected by higher prices. It is sufficient for the purpose in view to know that the withdrawals in 1901 were about 82,500,000 pounds and those of 1902 fell to about 72,750,000, a falling off of 10,000,000 pounds, which shows that every available ounce of old stock was utilized to eke out requirements until the new tea would once more be free of duty. We have in addition to this evidence, the general knowledge that invisible supplies were exhausted and that the tea cleared after Jan. 1, 1903, went into immediate consumption, the country being denuded of stock. We thus have a point from which we can start with a clean slate.

The importations in the five years ending June 30, 1907, have been the largest recorded for any 5 years in the history of the trade, aggregating about 493,500,000 pounds, which for the five years gives an average of 98,750,000 pounds per annum. But to this importation has to be added stocks in bond on December 31, 1902, viz. about 29,000,000 pounds, which brings up the quantity of tea available after January 1 to about 522,500,000 pounds and makes the average per annum for the five years about 104,500,000 pounds.

Since the normal period 1892-1896 the population has increased by about 14,000,000, and was at the last Census a little over 84,000,000, so that on the basis of 1·36 pounds per head, the annual consumption should be about 114,500,000, and the figures we previously arrived at (104,500,000) show a shortage of about 10,000,000 pounds per annum for five years.

We have now to consider a factor which has assumed importance within the last few years The influence of the increase in the proportion of India and Ceylon teas now imported cannot be ignored, as they constituted about 19 per cent. of these last season. In the five years 1903-1907 some 82,750,000 pounds of India and

CEYLON TEA CAME INTO THE COUNTRY,

equal to an average, on the five years, of say 16,500,000 pounds per annum.

The strength of these teas is from 40 to 100 per cent. greater than those of teas from other countries. Taken at 60 per cent. greater relative strength, that percentage must be added to the general imports, viz.: (9,900,000 pounds) which very closely accounts for the

10,000,000 pounds per annum shown to be short on the hypothesis that the consumption is 1·36 lb. per capita. The selection of the figure 60 per cent. is not arbitrary, but is based upon the authority of the British Customs House who reported that India and Ceylon tea, compared to those of other countries, was as 7 to 5, or in other words plus 40 per cent. As the comparison was made with the class of tea imported into Great Britian it is reasonable to assume a higher relative strength when making comparisons with those imported into the United States. Indeed, it is probable that all teas now imported should have some percentage to their credit, as the comparison is being made with present figures compared to the time prior to the passage of the Pure Tea Law.

While the claim here made is that there has been no reduction in the actual consumption of liquid tea in this country the most favourable construction of the figures will not do more than provide for consumption and leaves no margin for replenishment of stock depleted during the period when duty was levied on imports.

The very large net importations of the years 1903-1904 and 1905 may, to a limited extent, have admitted of some stocks accumulating in the interior, but it seems clear that the smaller importations of the following years 1906 and 1907, being less than the requirements for consumption, these stocks must have been drawn from and are now greatly reduced.

The general deduction to be drawn therefore is that invisible stocks must be extremely low, or practically non-existent in the country, and with short crops in the countries of production. greatly increased buying by Russia after a period of inactivity, larger consumption in Great Britain since the reduction of the duty there, and consequently the high level of prices in London, Calcutta and Colombo, the tea market here is in a condition where an advance in prices must take place, as spot teas cannot be replaced at the same prices for many months to come. We appear indeed to be on the eve of an era of higher prices all round.

TEA IMPORTER.

THE CULTIVATION OF RICE.

SUCCESS ATTAINED BY THE APPLICATION OF BASIC SUPERPHOSPHATE.

Analytical Laboratory, 79, Mark Lane,
London, E.C., Jan. 3rd, 1908.

SIR,—As the question of extended Rice cultivation appears to be attracting attention in Ceylon just now, I send you a carefully copied extract from a paper by Professor Harrison on British Guiana read before the West India Committee in London.

You will notice that he speaks favourably of Basic Superphosphate as a source of Phosphates for rice and regards Superphosphate and Slag as less suitable, the former being too acid for soils naturally deficient and Slag being too insoluble in its character.—Yours faithfully.

JOHN HUGHES.

Extract from Professor Harrison's paper on British Guiana read before the West India Committee, London, 1907.

RICE.

The next important agricultural industry is that of rice growing. This is emphatically one pursued by small farmers, and its development has been mainly due to the East Indian settlers in British Guiana. It is gratifying to be able to state that the black people in the colony are at present also entering with some enthusiasm into this industry. It is, however, only fair to the proprietors of sugar estates in the colony to point out that they have given every encouragement in their power to their employés to carry on rice-growing.

The returns made to the Board of Agriculture clearly show the great extension which has taken place in this industry of recent years. In 1900 the acreage returned by cultivators as being under rice was about 6,000 acres, in 1906 it was returned as about 24,000 acres, while it is estimated that for this year about 26,000 acres of rice will be under cultivation. The increase in the crop of rice between 1900 and 1906 represents about 12,500 tons of cleaned rice per annum, the value of which probably is about £125,000,

The large area now being cultivated in rice has been used for that purpose without displacing the cultivation of any other valuable product. Hence the rice produced, whether used in the colony or exported, is a clear gain to the resources of the colony. For some years

all the rice produced was used in the colony, replacing rice formerly imported from India, but a year or so ago a commencement was made of an export trade with the West Indian Islands and about 700 tons were exported from the colony during the year 1906-7. The export returns to April, 1907, show that this amount will be very largely exceeded during the present year.

The enormous area in British Guiana suitable, ormore cor re ctly speaking, pre-eminently suitable, for the cultivation of rice, will enable the colony to become the granary for the West Indian Islands when the cultivation of Sea Island cotton attains the great development which appears to be in the near future for it. Even if the Islands throw all their available land into cotton, a product which does no appear likely to be produced on a large scale in British Guiana, that colony will grow the rice for the food of their inhabitants, a very fair division of labour and in all probability also of profit.

The rice generally grown in British Guiana is known as Creole rice, and seems tobe a variety which has originated there by unconscious selection. It is of excellent quality, quite equal to any that has been imported into the colony. The choicest type of the Creole rice is that known as the "Berbice" Creole. The only variety which appears to excel this type in quality is that best of all rices, the Caroina Golden Grain, but it is hoped by experimental cultivation to obtain even better kinds in future.

With this object in view large numbers of varieties of rice have been imported into the colony by the Board of Agriculture. About seventy of these are at present under cultivation at the Government Experimental Fields. From among these it is hoped to select kinds which will give satisfactory yields in the lands of the interior of tho colony, so that those engaged in the forest industries and in the exploitation of the various mineral products may grow rice and thus supply at least a part of the food they require.

The experiments with varieties have been utilised as far as feasible to ascertain the probable manurial requirements of rice under the conditions under which it is grown in British Guiana. Nitrogen is not required as a manurial constituent as the creek-waters used to irrigate the growing crops supply it in ample quantity, and where the soil is at all rich in nitrogen the rice is almost invariably laid. Potash also does not appear to be necessary as a manurial application, the rice soils containing it in abundance, whilst it is generally present in small quantities in the irrigation-waters. On the other hand, the judicious use of phosphates appears, on the whole, to be advantageous; superphosphate of lime cannot, however, be recommended as at times its use has resulted in decreased yields; slag phosphate is preferable to it, and may be applied without risk to the crops; but as far as the experiments go the application of so-called basic superphosphate, a preparation introduced by Mr. John Hughes, F.I.C., has given the most satisfactory results.

"TREE CULTURE BY STREAMS AND RESERVOIR—AFFORESTATION IN WATER WORKS AREAS."

It would be superfluous to give instances of the destruction of forests causing the gradual drying up of springs and streams, and consequent widespread barrenness. The covering of the catchment areas with forest growth diminish the quality of silt brought down by the heavy falls of rain, and the roots of the trees having rendered the soil open and porous, the surface flow would be retarded at the time, and the flow into them would continue long after the rains had ceased. Forests exercise a most powerful influence on the consolidation of the soil and the maintenance of earth and rocks on the slopes of the hills. They act both by the trunks and the roots of the trees.

The action of trees in preventing landslips is two-fold. Large quantities of water are annually lost from the reservoirs of the country by evaporation, caused by the barren and hot surface of the land surrounding the reservoirs. The planting of trees will certainly be to diminish evaporation; many clouds charged with vapour would be attracted by the coolness about the trees, and the result would most probably be a deposit of rain.

Many illustrations can be given from the evil effects of a barren and dry surface of land surrounding several of our reservoirs. It has been asserted, and theoretically the contention is doubtless correct, that masses of woodland increase the rainfall. The causes of this result are sought for in the reduction of temperature associated with forests, and in the greater absolute and relative humidity of the air in woods. Trees do, however, under certain con.

ditions of the atmosphere, condense dew on their leaves and branches, and this effect may often be seen in the wet state of the ground underneath trees on a foggy morning, when the surface elsewhere is comparatively dry.

In a district of heavy annual rainfall a smaller proportion of the precipitations is caught and evaporated from the trees than where the rainfall is light.

Similarly in the case of heavy and long continued rain, as contrasted with gentle showers; in the latter case, in fact, but little of the water reaches the ground through the leafy canopy of a dense forest. Then again much depends on the kind of tree, evergreens intercepting more water throughout a year than deciduous trees and a larger proportion of the rainfall is evaporated from the leaves and branches in summer than in winter.

Where water supply for domestic purposes is concerned, the avoidance of violent freshets on the one hand, and scanty flow on the other, is alike desirable.

The water of a reservoir surrounded by well-stocked woodland is not subjected to the same amount of violent agitation during gales as is the case when such sheltering agency is absent.

To the credit of forests is also to be placed the fact that they exercise a purifying influence both on the air and on the soil, germs of all kinds being markedly scarcer in a well-wooded district than in a similar extent of tree-less country.

Afforestation in Water Works Areas.—This is a very important question to all Corporations and Water Boards, more specially in Tropical countries. Valuable work has already been undertaken by many of our public bodies in the British Isles, the most advanced being the Corporation of Liverpool in connection with their water supply from Lake Vyrnwy, in Wales.

The work of afforestation, over the whole of the catchment area, is being carried out in a most thorough and systematic manner.

Many other Municipalities, during the past few years, have also had similar schemes placed before them. It is, therefore, very desirable to draw the attention of all Municipal bodies, to the advantages and profits to be derived from planting their catchment areas with trees which ultimately will not only contribute materially to the retention of the rain that falls over the area, and thus assist in regulating the water supply in preventing floods and water famines, but will tend to the purification of the water and should also, properly managed, yield a fair and regular income on the capital expended. I am of opinion, that this is a direction in which a considerable amount of afforestation may usefully be done. To prevent all risk of contamination of the water supply, it is the policy to *remove all human habitations, as well as live stock*, from such areas. These areas, therefore, however well suited they may otherwise be for the production of crops or maintenance of live stock, are practically abandoned, and yield no return, beyond that obtained from sale of the water, upon what is usually a very heavy capital expenditure on the part of the Corporation. Such catchment areas, if they are to be thus utilised, should be placed under the control of a competent and experienced person.

Such areas must be planted with a mixture of timber producing trees for permanent and secondary crops; the secondary crop to be gradually cut out whenever the trees become suitable for agricultural or other industrial purposes.

Over the area, every second row where possible, can be planted with quick-growing species of trees, which will necessitate a commencement of thinning out.

Government cannot too strongly impress upon every Municipal body the great importance attached, to this question, in the preservation and purification of their water supply.

ARBORIST.

CEYLON'S CARDAMOM EXPORTS FOR 1907.

"I cannot understand," writes a cardamom grower, "the export of Cardamoms being so heavey, for 1907; all estates for the past six months are very short, both on Rangalla side and Matale, yet the exports have not dropped. Is it possible that South India Cardamoms sent to Ceylon and re-shipped are included in the returns?' No, we learn on enquiry from the Secretary of the Chamber of Commerce, the South Indian cardamoms imported for re-shipment are not included in the Chamber's export able as Ceylon cardamoms. There is apparently something wrong, however. The area under cadamoms in Ceylon in 1906 was 8,744 acres and the exports of the spice 73?,136 lb. Now in 1907 the area is only 8,451 acres and yet from 293 acres *less* the export for 1907 shows an increase of 33,334 lb. over 1907—and that too in spite of reported short crops all round. Can any reader suggest an explanation.

CEYLON TEA AND RUBBER.

BY SIR HENRY A. BLAKE, G.C.M.G.

[*Extract from paper read before the Royal Colonial Institute.*]

The acreage under tea in 1906, which is the last year for which I have complete returns, was 461,260, and the total weight of the tea exported was 170,527,126 lb. The yield per acre varies from 350 to 800 lb.—in one or two estates even as much as 1,000 lb. has been obtained—the greater weight of leaf in the lower levels compensating for the superiority of flavour in the higher. Tne average return was 370 lb. per acre, on which at present a duty amounting to £3 1s. 8d. per acre is paid on the tea imported into the United Kingdom. The reports for 1907 show that the crop and prices are both good, and the tea proprietors of Ceylon may be congratulated upon excellent prospects and a position as stable as they have enjoyed since the hardy tea plant first replaced the ruined industry of the coffee grower.

The Ceylon Rubber Industry Today.

I have given you some particulars of the two great industries of tea and coconuts, the former supplying in value 56·7 per cent. and the latter 21·2 per cent, of the total exports. But within the past four years another industry has come to the front that widens the basis of Ceylon prosperity, and bids fair to become the second in value if not the leading export of the island. In 1903 there were but 11,595 acres planted in rubber. Then came a great rise in the market price, and copitalists realised that Ceylon possessed all the necessary capabilities for the production of so valuable a crop. Land was taken up in feverish haste, and every officer of the Government who could assist in its survey, settlement, and sale was devoted to the duty of satisfying the demands of impatient capitalists. In a colony where large numbers of proprietary rights were undetermined the Government was bound to insure that every title granted to purchasers should be valid and free from claims, and in many cases this process necessarily involved considerable delay; but the Government did everything in its power to expedite matters, with the result that up to the middle of last year the area acquired and being cleared for rubber was over 120,000 acres, and companies had been formed with an aggregate capital of £700,000.

The Ceylonese, too, are taking up the planting of rubber, and experiments as to its cultivation under irrigation are being made by the Botanic Department. It is, so far, growing well in the North-West Province, and I see

NO REASON WHY EXTENSIVE PLANTATIONS MAY NOT YET BE MADE EVEN IN THE DRY REGIONS,

where irrigation is available. In April, 1906, it was proposed to have an

Exhibition of Rubber,

including everything connected with its production in the raw state, and of all the processes of preparation and adaptation to the various uses to which it is applied. After consideration we decided that the Exhibition should be built in the grounds of the Botanic Gardens at Peradeniya, and be opened from September 13th to 27th. We invited all rubber-producing countries to send exhibits, and were fortunate enough to secure as judges three experts from London—Messrs. Brett, Smithett and Devitt—whose decisions were given after most exhaustive examination, and whose lectures during the Exhibition, on the preparation of rubber for the market, were full of interest and value to those engaged in the cultivation. Each morning a lecture was delivered at the Exhibition by a member of the scientific staff of the Botanic Department of Ceylon, or by competent speakers from other countries, and these lectures, with the discussions that followed, were afterwards produced in book-form by the Botanic Department, and by Messrs. Ferguson of the *Ceylon Observer*. These books contain nearly all the practical information known about the production and preparation of rubber up to the time of the Exhibition. One of the most interesting of the lectures was that delivered by Mr. Herbert Wright, then Controller of the Experiment Station at Peradeniya, but now, I believe, holding the responsible position of Editor of the *Rubber Journal*. He accepted 60,000 tons of rubber from wild sources as a constant annual quantity, and taking 65,000 tons as the demand for rubber in 1906, to be increased by a growing demand of 5,000 tons annually, he assumed that the demand for cultivated rubber would, in 1917, require 60,000 tons, for the production of which an area of 960,000 acres would be necessary. Again, he entered into the question of the production of rubber from an acre, and gave a warning against over-production.

The actual experience of tapping 198,000 trees in Ceylon and the Straits Settlements in 1905 gave 240,000 lb. of rubber, and in 1906 the tapping of 10,000 trees in Ceylon of the average age of ten years gave 30,000 lb. Now, in calculating the

PROBABLE VALUE OF GROWING PLANTATIONS

in Ceylon, we may take a planting distance of 20 feet by 15, or 150 trees to the acre, as the most suitable, and if we accept from seven-years-old trees a return equal to one-half of that secured from 10,000 trees of ten years' growth, it will give 275 lb. of rubber to the acre. I have calculated roughly that the cost at which an acre of rubber will stand in seven years, including purchase, clearing, planting, weeding, and interest on outlay, will average about £22. What the price of rubber may be at that date who can say? But, if we take it at 2s 6d per lb., the annual gross return of £34 7s 6d per acre will leave a handsome margin of profit to the investor.

There are at present at least 140,000 acres planted with rubber in Ceylon which, on the estimate that I have adopted, will in six years return annually 14,062 tons, value £3,937,360, which will almost equal the value of tea exported in 1906.

A STRANGE ROMANCE OF RUBBER.

At the Port of London.

Let us try to trace the history of rubber from its earliest stage until it reaches that focus of commerce and adventure and romance—the Port of London.

Imagine, then, in the forests of South America, of Madagascar, Mozambique and the Western States of Africa, of Assam, Rangoon, the Straits Settlements, Java—imagine the planting of that seed, the gradual growth of the rubber-giving tree, with its large trifoliate leaves to its height of sixty feet.

The moment comes for the rubber to be extracted. After some years' growth a deep horizontal cut is made near the base of the tree. From it a vertical incision extends up the trunk and is joined by oblique incisions running into it at intervals. A shallow cap is placed beneath the lowest cut and into it there flows gradually a milk-like fluid. This is the rubber in its first state.

The trees are "tapped" in the evening. The following morning the juice is collected. Each tree yields about six ounces of juice in the course of three days. The milky fluid is contained chiefly in the middle layer of the bark in a network of tiny tubes. The precise method of "tapping" varies in different countries and in some cases the rubber is allowed to drip on to large leaves spread upon the ground to receive it.

This fluid must now be dried. Sometimes the contents of the cups are just poured out on the earth and the sun is allowed to do its work, but in the case of the finer qualities of rubber more care is needed.

As the rubber dries its colour changes. It becomes black and hard. In that condition it is packed in bales, carried down to the coast and loaded on the tramp steamers often in quantities of ten tons in one cargo. Thus it reaches the Port of London.

The Para rubber, which in quality is the best, co mes ins olid blocks weighing about a hundred weight. This is the kind of rubber used in the manufacture of billiard-table cushions. From Mozambique the rubber comes in bales like gigantic sausages, from other places in thin sheets—'biscuits' the trade calls them. And these 'biscuits' fetch the best prices, selling at about 4s. the lb.

RUBBER FROM PARA.

Strange, indeed, are the shapes in those rubber cargoes! 'Knuckles,' 'negro-heads,' 'thimbles,' 'nuts,' 'tongues,'! They are unloaded all of them at the Port, weighed duly in cases, and samples are cut off for the inspection of dealers. The cases are then stored in the warehouses to await the auction sales which take place each fortnight in Mincing-lane.

Thus—for we must follow its fortunes to the end—our rubber passes into the hands of the manufacturers and their activity begins. They boil it, they roll it, they grind it to rid the crude substance of impurities, they vulcanise it to render it resilient and to increase its resistance to air and water. And here let us note as one of the most remarkable facts of all modern industry—the increasing importance of rubber in the sphere of daily life. Take the figures:—

They refer to the imports of rubber into the Port of London:—

Hundred weights.

1902	1903	1904	1905	1906
25,902	29,833	41,168	48,423	91,254

and they represent in value:—

1902	1903	1904	1905	1906
£	£	£	£	£
202,217	319,591	497,621	555,845	1,011,472

Thus we see the remarkable increase that goes on year after year in the use of rubber. In 1830 the total imports to this country only reached 464 cwts.; this year London's imports alone will probably exceed 5,000 tons. At the end of last year there were more than a thousand tons of rubber stored in the warehouses at the London docks and wharves.

COLUMBUS.

About five hundred years ago, Herrera, during the second voyage of Columbus, observed the Haytians playing a game with balls made from "the gum of a tree," and he notes that they "bounced better than the wind-balls of Castile"!

In the seventeenth century the Spaniards in Mexico used the juice of the tree to waterproof their cloaks, but Europe had no hint of the discovery until many years after, when an English writer mentions as a novelty the sale of some half-inch cubes for erasing at 3s each! It was not until the beginning of the eighteenth century that the industry can be said to have really commenced.

Even after a rubber article has been discarded the virtue of its fabric is not allowed to be lost. Waste rubber is reclaimed and, compounded with the crude article, comes to us again in the soles of our tennis and seaside shoes. I talked to a rubber broker the other day on the future of the industry.

"More rubber is being demanded for the world's use every year," he said, "but the supplies keep pace. The reason is that growers who formerly went in for tea planting have found rubber-production more profitable, and this, of course, tends to keep the market well supplied."

Go to the Port of London! Search and find the rubber waiting as it has come from the ends of the earth to serve our convenience. Look at it and you will thrill with the romance of trade as exemplified in rubber and the vast activity of the Port of London.—*Evening News*, Jan. 20.

HANDY METHOD OF MEASURING GIRTH OF TREES.

Those who have to spend time in taking measurements of the girth of rubber and other trees will find the following method considerably shorten their labours. Take a piece of strong, tough paper or highly glazed calico 1 or 1½ inches wide and measure it out into inches and feet. I have found the prepared tracing paper or cloth used in plan making very good for this purpose. Begin the measurement a little way from the end of the tape and through the one inch line put a strong large drawing pin folding the rest of the tape over and if necessary stitching it to keep the flat head of the drawing pin in place. The measuring tape is now ready for use and if the girth of trees are to be measured the procedure is as follows:—Place the measuring tape round the tree overlapping it and press the drawing pin into the tape where it crosses again. This will leave a clean round hole in the tape the length of which can either be recorded at the time or else if an average is required the tape can be taken home and the number of holes at different distances recorded. The smallness of the diameter of the pin, about 1-40th of an inch, reduces the possibility of two measurements falling into one hole to a minimum. I have found that even when many hundred readings are taken all the holes can be deciphered.

J. B. CARRUTHERS.

—*Straits' Agricultural Bulletin* for Dec., 1907.

PLANTING IN NYASALAND

is a small affair so far as Sir Alfred Sharpe reported to the R. C. Institute. The value of exports from the Protectorate for the past year was a little over £50,000. Imports amounted to £222,000. Up to the year 1904 coffee was the chief export; low prices, however, which have ruled for some years, operated against extensions in this direction; and now cotton has taken the place of the former leading product. Last year cotton to the value of £16,000 was exported. The prices realised for Nyasaland cotton have been good, as much as 11d per lb. having been obtained for Egyptian, whilst American has fetched up to 8½d. The area at present under cotton is about 7,000 acres. The Manager reports:—My acreage under American cotton this year (1907) is 700 acres, which was all planted with carefully selected seed grown here last year. Prospects are excellent. I estimate 70 tons of ginned cotton. To cultivate and harvest cotton, and do it well, costs £2 per acre in native labour. Tobacco planting has increased considerably of late, last year's export being 414,000 lb. as compared with 199,000 during the previous year. The greater part of this went to South Africa; but there appears to be a probability that in future it will be the home market which will be looked to. Coffee to the value of £10,000 (455,000 lb.) was exported last year. The other chief exports were:—

Strophanthus (drug)	...	£4,000
Ivory	... ...	£1,600
Rubber	... ...	£3,500
Maize	... ...	£3,000
Oil Seeds and Ground Nuts		£3,200

AN ANNUAL REPORT ON COCOA.

London, Jan. 20.—The year 1907 is memorable for the high level at which prices of almost all descriptions of Cocoa have been maintained. The cause of this advance is not far to seek. Had it been due to large speculative transactions, stocks would everywhere have increased and deliveries would have fallen off, but last year the exact contrary happened. Stocks at the end of July were lower than for years past, whilst one of the chief features of the market, notwithstanding frequent rises in Manufacturers' quotations, has been the steady increase in Consumption in the chief countries of Europe and the United States, which however was checked in the latter country by the monetary difficulties during the Autumn to such an extent that the total Consumption for the year shows an apparent *falling off* of about 6 per cent. Perhaps the United Kingdom ought to be excluded, as the Duty payments do not show any material increase, although in this country the price has hardly been raised at all to the public. Seldom has there been so great a rise in prices with so little outside speculation as was the case last year, at any rate as far as the London market was concerned.

CONSUMPTION OVERTAKES PRODUCTION.

There can be little doubt, however, that the higher range of prices is due to the fact that the *Consumption* of Cocoa throughout the world has for a time overtaken *Production*, and whilst the Production of Cocoa generally shows on balance a moderate annual increase. Consumption during the last few years has been going up by leaps and bounds, more especially in Germany and the United States. No doubt the high prices will encourage increased Production, but Cocoa takes several years to grow before large crops can be obtained, and if Consumption continues to be maintained, the future of the market will probably depend during the next few years on the output of the Cocoa Plantations already in existence on the Gold Coast and other Settlements in West Africa. From the Gold Coast the exports in 1906 were 20,000,000 lb., against 11,000.000 lb. in 1905. For 1907 a further increase is expected.

The market, which had already improved considerably during the latter part of 1906, opened at an advance of 20s to 25s on the prices ruling in January, 1906, and, speaking generally, had a hardening tendency during the first half of the year, and with moderate fluctuations from time to time, prices at the end of July showed a further rise of 10s to 18s per cwt.

As the Bahia crop begins in July, and exports from the larger countries of production are heaviest during the latter months of th year, Manufacturers usually allow their stocks to run low in July, relying on replenishing them as new crops come in, when prices might naturally be expected to give way to some extent under the influence of heavy supplies. The very high prices obtainable had induced operators to sell new crop Bahia for July shipment to a large extent, and when it was found that the crop was somewhat later than usual, and that Planters were not eager to sell, "Bears" tried to cover; this led to a sudden and unexpected rise which affected all descriptions of Cocoa, and prices during August, September and October advanced from the high level then current a further 20 to 25 per cent. At this time a fair business was done to the Trade at from 115s to 120s for good to fine descriptions of Trinidad and other West India, and up to 120s for fine St. Thomé and superior Bahia. In Guayaquil, Caraqez sold as high as 123s, and fine summer Arriba up to 125s; hardly any sound cocoa was obtainable under 108s, and some transactions were reported in Accra at this price, whilst ordinary unfermented Dominica realised 110s to 112s per cwt.

What the course of the market would have been if

THE FINANCIAL CRISIS IN THE UNITED STATES

had not occurred it is impossible to say, but the effect of this catastrophe, which developed in November, has been that in addition to an exceptionally high bank rate here and elsewhere, the largest consuming country has for a time ceased to be a buyer in the markets of the world. This encouraged uncovered sales of Bahia, &c., for forward delivery at comparatively low rates; as there was at the same time considerable pressure to sell Accra cocoa, prices were forced down day by day until sales were made showing a drop of about 40s per cwt. from the late highest point, and the market had now fallen into such a sensitive state that the news of considerable purchases made in Bahia by English Manufacturers was sufficient to frighten the "Bear" sellers into immediate covering, and prices of "fair fermented" Bahia were driven up from 68s to over 90s per 50 kilos c.&f. within a week. The market afterwards became dull and depressed, and prices have given way again to some extent, the latest quotations of cocoa, generally at the end of the year being

about on a par with those in July before the last rise took place.

The following figures show the consumption in the different countries from which we have been able to obtain the most reliable information available :—

CONSUMPTION IN EUROPE AND THE UNITED STATES.

	1907. lb.	1906. lb.	1905. lb.
United Kingdom 12 months to 31st Dec.	44,445,200	44,387,900	46,496,200
Germany 12 months to 30th Nov.	77,208,500	77,495,800	64,931,400
Holland 12th months to 30th Nov.	b45,188,000	b47,121,500	b42,038,900
France 12 months to 30th Nov.	51,499,600	51,290,200	47,335,500
Spain 12 months to 30th Nov.	a11,938,300	13,374,300	12,812,700
Belgium 12 months to 30th Nov.	13,199,200	12,884,200	11,945,700
Austria 12 months to 30th Nov.	a6,897 000	6,786,400	5,9 1,600
Italy 12 months to 30th Nov.	a3,249,300	3,116,700	1,966,200
Switzerland 12 months to 30th Sept.	16,476,500	13,809,000	11,642,700
United States 12 months to 31st Dec.	78,955,000	83,690,000	74,200,000
Total	349,056,600	353,956,000	319,290,600

b These figures show the quantity of cocoa imported into Holland.
a Estimate.

COCOA IN TRINIDAD.

Increase since 1903 about 31 per cent.

In consequence of the shortness of the crop in Trinidad during the summer of 1906 prices of Trinidad in London in January, 1907, were rather high compared with other West India, being 88s to 89s for middling red, and 90s to 95s for good to fine Plantation. With a few unimportant fluctuations these were about the quotations for the first six months of the year, and in July fine marks of Trinidad were sold at 95s per cwt. The transactions in the London market have, however, been less than usual, partly owing to smaller importations and also to the fact that one of the largest Manufacturing Consumers of Trinidad Cocoa in our market being well stocked has hardly bought at all during the year. When the general rise took place in August and September, Trinidad (which had become relatively cheap compared with other cocoas) participated, and prices rapidly rose till some large sales were made of fine marks as high as 120s per cwt. Prices afterwards slowly declined, but not at all to the extent that took place in other descriptions of Cocoa, and hardly any transactions were reported up to the close of the year below 103s per cwt. for middling red, and 105s to 108s for good to fine Plantation. Considerable sales were made during the year for arrival on c. and f. terms to Havre with usual options, and prices have ranged from 80s per 50 kilos in February up to 110s in October, but hardly any of these Cocoas came on to London. In October sales were reported made in Trinidad at much higher equivalent prices for shipment to United States. During the autumn several crops and part crops of Plantation Trinidad were sold chiefly from 105s to 110s per cwt., London landed terms Havre with options, some for shipment from 1st October, 1907, to 30th September, 1908, and some from 1st October, 1907, to 31st March, 1908.

The crop shipments from 1st October, 1906, to 30th September, 1907, were 12,000 bags less than in the previous season. The imports into London for the year 1907 were 17,762 bags, against 18,534 bags in 1906, and 31,298 bags in 1905, and the deliveries for Home Consumption 12,183 bags against 14,632 bags in 1906 and 28,752 bags in 1905.

THE DISTRIBUTION OF THE CROP

according to the circular of Messrs. Gordon, Grant & Co., was as follows :—

	1906-07 Bags.	1905-06 Bags.	1904-05 Bags.
*England ...	41,343	31,941	44,895
*France ...	54,803	66,317	86,712
America ...	84,725	94,535	85,335
Total ...	180,871	192,793	216,942

* The above list shows the consignment merely, but the ultimate destinaion of the Trinidad shipments to Europe is not determined until arrival.

GRENADA.

Owing to the scarcity of Trinidad on the spot, fine and superior qualities of Grenada were in strong request at the opening sales of the year, 86s per cwt. being readily paid, an advance of 5s per cwt. from the last sales of 1906. The Trade, however, did not seem disposed to support these prices and a gradual decline took place. Importers were willing to meet the market, and for the first two months of the year a considerable business was done down to 80s per cwt. The landings of Trinidad being still unusually small led to an increased demand for Grenada, and prices again rose steadily. In August, September and October, owing to Continental orders, the advance was very strong, and transactions were reported up to 122s 6d per cwt., the price of Grenada at that time actually exceeding that of Trinidad. This demand having been filled for the time, the market became quieter, and prices gave way to some extent. The state of financial

affairs in America caused a further decline, and at the close of the year the quotation for fine was 99s per cwt. During the autumn a considerable number of fine Estate crops were sold from 100s up to 110s per cwt., London landed terms. Hâvre with options, for shipment from 1st October, 1907, to 30th September, 1908. The transactions in London as reported in our Summary were 3,050 bags less than in 1906. The imports into London were 27,488 bags, against 30,396 bags and 41,967 bags in the two previous seasons, and the deliveries for Home consumption were 15,999 bags, against 24,930 bags in 1906, and 34,650 bags in 1905.

The shipments from the 1st October to the 30th September were as follows, viz :—

1906-07.	1905-06.	1904-05.
60,087 bags	54,381 bags	64,328 bags

WEST INDIES GENERALLY.

What has been written of Grenada applies almost equally well to other descriptions of West India cacao, and the fluctuations of the former have been closely followed by Jamaica, St. Lucia and Dominica. The transactions in London of Jamaica during the year were only a little more than half the quantity reported during 1906, being 3,466 bags against 6,224 bags last year. This was no doubt due, partly to the effects of the earthquake and partly to the drought from which the Island suffered. The transactions in St. Lucia on the other hand have nearly doubled and were 3,004 bags in 1907, against 1,644 bags in 1906 ; the preparation of this cocoa has shown great improvement on previous years, and a considerably large quantity of fine fermented has been shipped, equal in quality to fine Grenada, and occasionally surpassing it in price. About 4,800 bags Dominica cocoa were disposed of in London during the year, this quantity showing a slight advance on that of 1906; the greater part of this consisted of unfermented cocoa, the quality and value being about equal to "fair" Grenada.

The Ceylon Industry.

The shipments from Colombo from 1st Jan. to 18th December exceed those for the same period of 1906 by 3,704,288 lb., being 9,080,960 lb., against 5,376,672 lb. last year, and are the heaviest yet recorded. The transactions in London, according to our summary, also show an increase over the previous year of 10,150 bags.

Supplies were not on a large scale at the opening of the market, and there was a strong demand for native kinds, whilst plantation realised fully steady prices, business being done at 67s to 79s for fair to fine native, and 80s to 86s for middling to good estates. For the next few months the course of the market was steady, there being very little alteration in values ; large quantities of both native plantation kinds were brought to auction, and the sales reported up to the beginning of May amount to over 30,000 bags. During May the demand again became active, and prices advanced 6s to 8s per cwt. in a few weeks. The market was then practically cleared, all the bought-in lots and lots offering in second hands were disposed of, holders being anxious to take advantage of the high rates ruling. In August and the two following months, in common with other growths of cocoa, prices rose rapidly and touched 115s 8d for native, and 122s for Plantation. There was a tendency to lower prices during November, which was emphasised by the financial disturbances in America, and prices quickly declined to the extent of about 15s per cwt. During December a fair business was done at a further decline, the closing quotations for the year being 91s to 100s for Plantation, and 70s to 81s for Native kinds.

THE SHIPMENTS FROM COLOMBO.

from the 1st January to the 18th December were as follows, viz. :—

1907.	1906.	1905.
lb.	lb.	lb.
9,080,960	5,376,672	6,535,984

GUAYAQUIL.

At the commencement of the year Guayaquil Cocoa was cheaper than West India, and this fact attracted the attention of buyers. During the first four months prices rose steadily 7s to 8s per cwt., whilst the value of West India descriptions showed very little change. The sales in this period were more than half the total transactions reported in London for the whole year. Prices still continued to advance without a break to the end of September, when 118s to 123s per cwt. was paid for Machala and Caraquez and up to 126s per cwt. for fine Arriba. In the meantime, the value of West India and other Cocoas had risen rapidly, and prices of all fine kinds were about on the same level. With the advent of the Financial crisis in America, and the general tendency to lower prices, Machala and Caraquez were driven down about 15s to 18s, whilst Arriba only gave way to the extent of 5s to 10s per cwt., a fair business being done at the decline. In December, however,

prices again fell, and the last quotations for the year were 98s to 110s for fair to good Arriba and 96s to 99s for Machala and Caraquez.

The receipts for Guayaquil for 1907 were 398,500 quintals, against 454,250 quintals in 1906, a falling off of 55,750 quintals. The transactions reported in London amounted to 18,100 bags, 1,700 bags less than the previous year.

COCOA IN AFRICA.

The receipts of St. Thomé Cocoa at Lisbon for the year 1907 were rather less than those of 1906, but on the other hand there has been a considerable increase in the exports of Gold Coast and other West African Colonies. The transactions reported in London, although larger than last year, form no adequate guide to the extent of the business in African Cocoa, as by far the largest trade in this Country is done in Liverpool, and Hamburg also absorbs a considerable quantity. The fluctuations in the price of Accra Cocoa have to some extent influenced the prices of other growths in London, more especially of commoner grades. The highest prices recorded in London were 120s per cwt. for St. Thomé, and 112s 6d per cwt. for West Coast Cocoa. In Liverpool the price of Accra ranged from about 62s to 109s per cwt. ex quay. The receipts of St. Thomè, &c., at Lisbon were as follows, viz. :—

1907.	1906.	1905.
402,176 bags	407,951 bags	425,196 bags

Transactions on the spot in other Foreign descriptions amount to about 8,000 bags, but with the exception of Costa Rica and Java the separate quantities are unimportant. Business reported in Bahia was small, as this growth has been chiefly sold to the Continent on cost and freight terms to arrive. Costa Rica, the quality of which is much liked in our market, has generally found ready buyers, both for fermented and unfermented kinds, and prices have been guided principally by the value of Grenada. Transactions in Java comprise about 2,000 bags, the greater proportion of which has consisted of medium and lower grades, values being about on a par with Ceylon of similar quality.

C. M. & C. WOODHOUSE.

LARGEST YIELD PER ACRE OF TEA IN CEYLON.

MARIAWATTE PLANTATION.

For many years our Directory recorded the wonderful yield of tea from the famous Mariawatte garden of the Ceylon Tea Plantations Company, and more especially from the special and oldest field of 101¼ acres on which plucking first began in October, 1880, and which was regarded as in full bearing in 1884 when the crop equalled 1,078 lb. made tea per acre. This was increased to 1,384 lb. in the bumper year 1890 and again rose to 1,357 lb. in 1900, the minimum yield so far from 1884 onwards being 1,044 lb. per acre in 1897. For the whole 17 years, the average was 1,357 lb. Through the courtesy of the present Manager, Mr. Bliss (and with the sanction of Mr. Talbot), we are now able to give the return from 1901 onwards to date, from which it will be seen that, while the yield fell off a good deal from 1903 to 1906 inclusive, last year showed a great improvement, and there is much assurance that the next two years will give equally favourable returns. Here are the figures :—

Yield old tea 101 acres 1 rood.

		Made Tea. lb.	Per Acre. lb.
1901	...	110,302	1,092
1902	...	101,991	1,009
1903	...	87,668	868
1904	...	80,901	801
1905	...	87,264	864
1906	...	87,163	863
1907	...	97,768	968

It must be very satisfactory to the management to see that since a regular system of more or less up-to-date cultivation was adopted, as opposed to the former method of occasionally applying manure carted from Gampola, the vigour of the old tea has been gradually built up and the yield increased.

As regards the whole estate of 458 acres 1 rood 17 perches; the result for 9 years from 1892 to 1900 was an average yield of 822 lb per acre—the maximum being 996 lb in 1900—minimum 643 lb in 1892. Here are the figures up to date :—

Yield of whole Estate 458a 1r 17p.

		Total Tea Crop. lb.	Per Acre. lb.	Rainfall inches.
1901	...	362,952	792	84·38
1902	...	411,392	898	128·31
1903	...	343,145	749	84·01
1904	...	314,205	686	123·79
1905	...	342,819	749	108·13
1906	...	363,045	792	92·33
1907	...	346,469	756	110·56

The average for the whole 16 years 1892-1907 equals 801½ lb made tea per acre for the 458¼ acres; and for the 24 years of the old field 101¼ acres, the average is 1,080 lb. We take it that such figures are without parallel in the history of Tea Cultivation in India or Ceylon, and long may Mariawatte and our Premier Tea Company continue to break the record.

SALT AND COCONUTS.

Mr. E. O. Felsinger, a coconut estate owner, who has taken a considerable interest in the scientific culture of the palm, writes a letter elsewhere today on the efficacy of salt, or the cheaper substance kainit when applied to the tree. Mr. Felsinger treats manure applied to the tree with kainit. The native method of manuring trees is simply to tie a bullock to the tree for a few nights, gather up the manure and cover it up, where in a short time it is a breeding place for insects and beetles: kainit prevents this. In places where the bleeding disease is very common at present, owners should certainly experiment with kainit: we have always advocated the use of denaturalised salt if Government would only give the needful permission.

PLANTING NOTES FROM THE N.-W.P.

COCONUT BLEEDING DISEASE—LOW-COUNTRY PRODUCTS ASSOCIATION.

Marawila, Feb. 7.—Weather very sultry and dry. Indications of rain are present in heavy fleecy clouds being wafted from the N.E. The canal is running very low and navigation along it is becoming very difficult.

"INCISION, BURNING AND TARRING."

During a visit I made inland from Madampe, I was much relieved to find the villagers had been treating their diseased coconut trees with incision, burning and tarring. On one estate belonging to a Sinhalese gentleman, the incised pieces were being carefully gathered in a basket during the operation. All this is as it should be. For how much of this should the Government be thanked. The estates afford object-lessons to those inclined to benefit by them. I believe the majority of the villagers are apathetic and tamely submit to Fate. These ought to be reached by Government Inspectors, for the safety of the coconut planting industry.

A European Matale planter, with whom I am not acquainted, wrote recently to me: "I shall be glad to hear from you what you think of the coconut bleeding disease. I have it here, but it is quite an easy thing to keep it in check, unless, of course, absolutely nothing is done to it. Surely it cannot be true that 8,000 trees are dying according to 'Agricola?'" Quite so. It is easy to keep it in check, unless nothing is done. What I have been endeavouring to do for many months past is to move the Government to devise means to keep it in check. So far I have heard of nothing having been done except the ramblings of a solitary Inspector to which the Secretary of the Agricultural Society makes reference with evident satisfaction.

BLEEDING DISEASE IN THE CINNAMON GARDENS.

It is to be found in a virulent form in the Cinnamon Gardens of Colombo. A.V.A. was lately taken to see some trees and he wrote to me:—"I do not think you have ever seen the disease in such a virulent form. Two trees dead and some dying." A few months ago this very gentleman wrote to me. I took too pessimistic a view of the disease. Seeing trees with hollowed-out trunks flourishing and bearing heavily, he did not think it was possible for the disease to kill a tree outright. He challenged me to point out to him *one* tree killed by the disease. He has now seen what neglect can do.

THE NEW LOWCOUNTRY PRODUCTS ASSOCIATION.

I welcome most heartily the formation of a "Lowcountry Products Association." The title is more comprehensive than a "Coconut Planters' Association" and will include cinnamon and citronella oil. Why not arrack and plumbago? If so, and if carefully piloted, it is bound to be in time as great a power in the land as is the Ceylon Planters' Association. The interests it will represent will be far greater in value and importance than those of the Upcountry Association. The initial stage of such an Association will be the most critical, and, therefore, we want such a tried and experienced public man as the Hon. Mr. S. C. Obeyesekere to guide its destinies. We want no fire-eaters.

THE LABOUR BUREAU.

If the sympathies of Revenue Officers and Headmen can be enlisted, I expect that the proposed Labour Bureau will prove to be of immense benefit to planters and to the indigenous population. Mr. Westland's crude scheme cannot be accepted. A good scheme can be prepared after consultation with the Association that is to be formed.

RUBBER IN MALAYA.

MR. L. W. B. DAVIDSON ON HIS VISIT.

THE NECESSITY FOR STOPPING FURTHER RUBBER EXTENSIONS.

COST OF LABOUR AND OF WEEDING.

COST OF PRODUCTION OF RUBBER F. O. B. IN MALAYA AND CEYLON.

Mr. L. F. W. B. Davidson, the well-known planting proprietor and V. A., returned from the F. M. S. yesterday by the P. & O. "Peninsular," after a visit to some of the leading rubber districts in the Federated Malay States. In conversation with an *Observer* representative today Mr. Davidson, in reply to questions, said :—

"The conclusion I have come to generally about rubber is that if men do not stop extensions, they will run up against a bad snag in the shape of shortage of labour. They are opening and developing rubber land in the Straits right from Penang to Johore ; and the very fact that in a lot of South Indian estates they have already had to raise the price of Tamil labour from 20 to 30 per cent satisfies me that, unless some limitation of the cultivation of rubber is brought about, there will be a serious shortage of labour within the next few years. You will recollect this is one of the dangers I pointed out in my articles in *Public Opinion* when I gave figures supporting my statements, and I am satisfied now there will not be labour available at reasonable wages to undertake the cultivation of any more rubber than is at present planted, and the going on with further extensions with a rush is an absolutely suicidal policy on this account alone. Besides it seems to me an unwise thing for a man to go on opening large areas of new land, which always involve an element of uncertainty, no matter how careful the selection is made, when today rubber shares in first-class young Companies can be bought at about par and in some cases even under par. It seems to me it would be far wiser for people to invest in these shares where the element of risk is to a considerable extent diminished than to go on clearing land with the certainty in doing so of helping to kill the goose that lays the golden eggs. There are a large number of first-class shares available at lower prices than land can be opened for today—for instance Weygangas in Ceylon and Langat Rivers in the Straits—and these are only samples of a large class which the intending investor could put his money in."

THE LABOUR POSITION.

"How did you find the position of labour ?"

"I cannot speak too strongly on the labour position—and I can speak with some authority because at one time, as you know, I had about 40,000 coolies working under me, and I have just been right through the labour districts of South India and on to the Straits. Chinese coolies in the Straits, although hard-working on contract work require to make 40 to 60 dollar cents a day, according to the position of the estate, which is an average of about 70 to 85 cents to a rupee Ceylon money, and now the planter before he will willingly pay this will increase the wages of his Tamil coolies, and, if this clearing of land continues, the profits from the rubber industry will be diminished considerably through the cost of labour. Javanese coolies are certainly very good ; but they cost 60 dollars a head to import or roughly R95, only half of which is recoverable ; and if the cooly dies or bolts the whole thing will be lost. I went into the question of importing these Javanese on a large estate with which I am connected, and it was decided that the cost was too high and the risk too great.

THE NEW LABOUR ORDINANCE.

"How is the new Labour Ordinance working?"

"I had the advantage of fully discussing the new Labour Ordinance in the Straits with the Hon. Mr. John Turner and Mr. R. W. Harrison,—two out of three of the unofficial members of the Committee which suggested it to Government. In my own case the effect of the Ordinance will, to begin with, be very severe because in the two estates with which I am principally connected we spent a very large sum of money in improving the health conditions of the property and establishing the labour force. I think some notes of what was done on Seafield will be useful information to my fellow-planters. When the property belonged to me at its early stages

THE SICKNESS WAS APPALLING

and the outturn of coolies very small. I instructed the Manager to spare no money in the proper treatment of the coolies ; and he engaged the services of Dr. Watson of Klang. The results have certainly been wonderful. We drained all the swamps and in some cases it cost us £50 an acre. Before the swamps were drained Dr. Watson used to take a pan of

water and find a large number of larvæ of the *anopheles* in it. Today the swamps are all absolutely clean, planted with splendid rubber and with no stagnant water whatever; and in his more recent investigations the Doctor has found an utter and complete absence of the *anopheles* in the water. Contemporaneously with this the health of the coolies improved enormously until the outturn now is veiy large and the coolies look happy and well, and one day, while I was there, 95 per cent. turned out to work and there was hardly a case of sickness. We are now enabled to lend a large number of coolies from both these properties to the adjoining estates. Every credit is due to both Dr. Watson and Mr Quartley, the Superintendent, and I think the results are well worth publication. Incidentally I might mention that at first we had difficulty in keeping our coolies and lost several thousand dollars in advances. Now that we have a splendid labour force established we can get as many more coolies as we require, this Ordinance has been passed by which we will be compelled to pay 5 dollars a head to Government on the outturn of coolies. In individual cases of this kind

THE ORDINANCE IS CERTAINLY A GREAT INJUSTICE,

but one must look at it from a broader point of view ; and when we find in the Straits that it is almost impossible to get a warrant against an absconding cooly, that a large number of Tamil Railway and Government contractors and Chinese mine owners simply crimp the coolies after they have been brought over and contribute nothing to the cost of importing labour, I think it is probably worth while giving the Ordinance a fair trial in order that everybody may help to contribute to the cost of bringing labour into the country. It is hoped that Government will see the justice of giving a reasonable rebate to the estates that have already had their trials and difficulties and at great cost established their labour force.

COOLIES' PAY.

"How about coolies' pay?" asked our representative.

"There is one aspect of the question that Ceylon planters would do well to seriously consider. Undoubtedly the cooly in the Straits can save a considerable proportion of his pay and large amounts are remitted to India. Is this the case in Ceylon today? If not, when it is remembered the Straits' cooly is given in addition to his good wages a free ticket right from his village to his destination on estate in the Straits, I cannot help thinking it will have a considerable effect on the labour supply of Ceylon. Undoubtedly the question of Sunday names will help to balance the matter, but Sunday names are by no means given all over the Straits, but only in certain districts; and although the hours of work may, with advantage to the proprietors, be extended in the Straits, from what I saw I do not think even then the Straits cooly will be so hard worked as his Ceylon brother is in properly managed estates in this country; so the planters here should not lay too great stress on that. After all a man's wages, whether he is white or black, is not what he does draw per diem or per memsem, but the crux of the whole question is what balance remains at the end of the month after he has clothed and fed himself. The Straits cooly has certainly a big advantage over his Ceylon brother today.

COST OF PRODUCTION: CEYLON *v.* THE STRAITS.

"I have not got sufficient statistics to make a fair comparison yet between the Straits and Ceylon in regard to the cost of rubber f.o.b., but this I can tell you, the cost of tapping last year on 4 estates there (of which Mr. Davidson gave the names) was 13 dollar cents per lb.; 16 dollar cents per lb., 16 dollar cents per lb. and 21 dollar cents per lb., and I do not know any estate in Ceylon which has been able to produce its rubber at anything like this average price. This is no doubt in part due to the fact that the rubber is older and more regularly planted in those estates than it is in Ceylon, but it is also, so far as I can judge, a fact that the latex flows much more freely in the Straits than it does in Ceylon. This is especially the case in trees that are widely planted and I saw one field (and not a small one) of 10 to 11 year old rubber (70 trees to the acre) that gave an average of nearly 6 lb. a tree for the last two years. On the good estates in the Straits the growth is undoubtedly much greater than it is in Ceylon. On Seafield, for instance, a lot of the 3½-year old trees are from 20 to 26 inches in circumference and they are tapping trees of this age on the adjoining estate, while on another estate close by last year the 3½ to 4½ year old trees tapped averaged 1 lb. rubber per tree. Personally I do not advocate this early tapping at all, especially if the rubber is closely planted, because it has been found that, although the trees are large, the bark is thin and, being tapped at this early age, it is very difficult to get the bark to renew properly.

WEEDS !

" What about weeds?"

" The question of weeds in the Straits seems to be in everybody's mouth here, and while undoubtedly this is a serious difficulty in somo properties, where, through shortness of labour or neglect or some other cause they have let in weeds, still there are numbers of estates absolutely clean, and where old rubber is being weeded at a nominal price. Vallambrosa, I believe, costs about 20 dollar cents an acre only per month and Seafield, quite a young place, is hand-weeded all over for 60 dollar cents an acre. Undoubtedly the rich loam there on some of the estates makes it difficult to eradicate weeds once they get in, but on Caledonia estate I saw a field of rubber, 40 acres in extent, 10 by 10', which was planted in original lalang grass, and at 6½ years old, under Mr. John Turner's very able supervision, there is not a sign of weed in it, and it has just given a maiden crop of 300 lb. per acre. This is proof that the Straits planter can get over his difficulty with regard to weeding although undoubtedly the weedy estate is a terrible tax on proprietors for the time being.

NEWS OF OLD FRIENDS A D NEW !

" I saw a large number of old Ceylon and South Indian friends in the Straits and they nearly all appeared to be doing well. On one estate we took a group of 5 old Travancore men. Mr. R. W. Harrison's old friends will be glad to hear he is looking very well indeed and he says he is much stronger since his operation. Mr. Henley, I am sorry to say, has had a good deal of low fever since he has been down there. I had no time to go and see him at his own bungalow although he came to dinner one night at a bungalow at which I was staying. Mr. Tisdall, however, wert to see him and there met a new pet Mr. Henley has got in the shape of an ourang-outang with red hair. Mr. Tisdall took quite a number of photographs of it. The effect on him was curious: for the next two days he did nothing but go into fits of laughter over this almost human being ! "

DAMAGING RUBBER TREES.

DESCRIPTION OF PESTS THAT OCCUR IN PLANTATION.

From Mr. F. Knocker, curator of the Perak State Museum, Taiping, we have received a copy of the Journal of the Federated Malay States Museums, to which Mr. L. Wray has contributed the following article:—Some years ago a large number of caterpillars appeared on the Para rubber trees at the Government Plantations at Pondok Tanjong, and did very considerable damage by defoliating the trees. Some of the caterpillars were sent to me, and I ondeavoured to rear them, but they all died in a few days' time: apparently because they had had rough treatment before reaching the Museum. The second outbreak of this same pest was in the early part of this present year at Gapis Estate, Padang Rengas, belonging to the Kuala Kangsar Plantations Company. Here again very marked damage was done to some twenty acres of young trees. Four of the caterpillars were sent to me in a tobacco tin, which had had some holes punched through it with a nail, the rough jagged edges of the tin projecting in wards. It is, perhaps, hardly necessary to state that they all died a few hours after arrival. Although I was promised more of the insects, they have never been sent.

IDENTIFICATION.

The following superficial description, which will be sufficient to identify the pest when it occurs elsewhere, was taken down when the insects were received : " General colour above black, minutely spotted and lined with white sides with a bright yellow, waved line, starting from just behind the third pair of legs and continuing to the tail. There are some conspicuous white spots on the shoulders and on the last segment but one of the body. Head and legs bright reddish brown, prolegs black largely spotted with pale reddish brown; beneath, black largely spotted with dull yellow. The largest specimen was some inch and a half in length.' In both cases, the fields attacked were next to some young secondary jungle or bluka, and the caterpillars were also found numerously on much of the vegetation composing it.

DESTROYING THE INSECT.

The remedy I proposed in both instances was the well-known one of poisoning the leaves by spraying them with water containing Paris green held in suspension, and the Musem spraying apparatus was lont for the purpose. It was reported that the treatment was quite effective and rapidly killed the pest. It may be mentioned here, as a good deal of misapprehension exists, that this poison acts by being eaten with the natural food of the insect—that is the leaf. Consequently it is necessary in applying it to mix with the water some substance which will make it adhere to the leaves. Otherwise, when they become dry, the powder

will fall off, or at any rate the first shower of rain will wash the leaves quite clean. The material I have found effective is a paste made with flour, or some other form of starch, which has been well boiled. A small quantity of this mixed with the water serves to fix the poison to the leaves sufficiently firm to withstand the rain. The mere contact of the poison with the body of the insect has no effect, it must reach the organs of digestion and be absorbed before it becomes operative. The object of spraying is therefore, to deposit a film of poison on the leaves which will subsequently be consumed by the leaf-eating pest which it is wished to destroy.

DESTRUCTIVE BEETLE.

Recently, considerable damage has been done to some young rubber trees at Lauderdale Estate, Matang, by the attacks of a green leaf-eating weevil, which I identified as Astycus chrysochlorus, Wied. In 1897 this same beetle did a very large amount of damage to many acres of Liberian coffee at Gapis Estate; and at the request of Sir W H Treacher I worked out its life history. The report, which was dated July 27, 1897, was published in Perak Museum Notes, Vol. II., Part I., p. 61-8. From this I will quote the summary, which will be sufficient here:

ITS HABITS.

The egg is laid in a small hole in the surface of the ground. On hatching, the grub burrows into the soil and lives on the well-rotted roots and other vegetable matter contained in it. Having attained a size of about ¾ of an inch in length, it forms for itself a chamber in the earth, about 2 inches below the surface, in which it undergoes its metamorphosis. The perfect insect burrows its way out of the earth at night and flies, probably the next day, in search of food. Having found a tree on which it can live, it stays on it while there is any leaf to eat, the females leaving the food plant from time to time to deposit their eggs in the ground.

ONLY SATISFACTORY REMEDY.

The results of digging showed that the grubs were most frequent in the cleanest land. I dug in grass and weeds in many parts of the estate, but could not find one. The same results followed digging in scrubes and lalang land, and also under the hedges. . . In the clear land, in one place, as many as six grubs were found within an area of less than one square yard, but, on an average, there are not more than one or two per square yard. Of course, the younger ones being very small undoubtedly escape observation when turning over the soil. At one per square yard we get 4,840 per acre, which is a sufficiently large total to account for a very extensive destruction of foliage. Taking into account the life history of the insect, there appears to be only one period of its life when it is possible to attempt to destroy it—and that is when it has attained maturity. Then it might be collected by hand picking or killed by poisoning its food supply with one of the arsenical powders applied as previously mentioned. Mr. E. Lauder Watson informs me that he has nearly exterminated it by hand picking. The same method was also reported by the late Sir Græme Elphinstone to be effective in ridding the Liberian coffee on Gapis Estate of the same pest.—*Straits Times*. Feb. 12.

THE PALM DISEASE.

ARECANUTS THE LATEST TO BE ATTACKED.

The latest information about the Bleeding Disease is that in addition to it attacking coconut and palmyra palms, it has made its appearance among arecanut palms, so that there is every warrant for believing that the disease is general among palms. Unless checked in time the mischief that it will create to the palmyra industry of the North will be even more disastrous than anything that can happen to the coconut industry, for the palmyra palm is the main stay of the thousands of people in the North. There is the need also now for looking out for the disease among the kitul palms, where the interests of the Kandyans are so greatly centred.

PREVENTIVE MEASURES.

Mr. Petch, in the company of Mr. Drieberg and Messrs H. L. de Mel, L. W. A. De Soysa and Mathias de Mel have been visiting Moratuwa and inspecting some gardens where the disease has appeared. Hitherto only curative measures have been adopted, but on the recommendation of Mr. Petch preventive measures are now being taken in respect of the young trees. This consists of spraying the trees with a solution of sulphate of copper and slaked lime, the quantities necessary being equal parts of sulphate of copper and slaked lime, say 6 lbs., and 25 gallons of water. Thousands of leaflets in the vernacular have been issued by the Secretary of the Agricultural Society containing advice as to how to combat the disease. For the guidance of others Mr. Petch is to give demonstrations in various centres and a start, as already announced, was made at Negombo on the 18th Feb.

THE COCONUT STEM BLEEDING DISEASE.

IMPORTANT ADVICE FROM THE GOVERNMENT MYCOLOGIST.

SIR,—Will you kindly publish the recipe for "Bordeaux Mixture," with the accompanying details and suggestions for treatment of the stem bleeding disease :—

BORDEAUX MIXTURE.

(1) Dissolve 6 lb. of copper sulphate in 25 gallons of water. This is best done by putting the copper sulphate in a coarse bag and suspending it in the water.

(2) In another vessel put 6 lb. of fresh lime, and add water slowly, say a quart at first, and when this disappears, another quart, and so on, until a smooth paste is obtained. When this is done, add water to bring the lime solution up to 25 gallons.

(3) When the copper sulphate is dissolved and the lime milk is cool, mix them by pouring them slowly together into another barrel, thus making 50 gallons of Bordeaux Mixture.

(4) Wooden or earthenware vessels *must* be used throughout. Iron or tin vessels make the mixture worthless.

A stronger solution may be made by reducing the water to 12½ gallons in each case instead of 25 gallons. *The mixture should not be made stronger than this.*

A barrel fitted with a pump and mounted on wheels is cheaper and more effective on coconut estates than the knapsack sprayers used in cacao disease. The Deeming barrel pump is recommended. The Bordeaux Mixture is only used to prevent infection. It is quite useless to spray diseased trees without cutting out the diseased parts. The fungus is inside the tree, and cannot be reached by any external wash.

CUTTING OUT DISEASED PARTS.

All the pieces cut out must be collected and burned. If left on the ground, the fungus will grow on them luxuriantly, and there will be far more danger of the disease spreading than there was before the tree was cut. A piece of sacking spread flat at the base of the tree will save some of the trouble of collecting. Where Bordeaux Mixture is being used the ground round the diseased trees should be *lightly* sprayed after they have been treated, in order to destroy the fungus on any chips which may have been overlooked.

When all the diseased tissue appears to have been cut out, cutting should be continued upwards and downwards for about an inch. This is especially important in dealing with young trees, because in soft tissues the diseased tissue thins out to an imperceptible thread and then expands again.

Bleeding does not occur until three months or longer after the tree has been infected. It is probable, therefore, that when the treo is first treated some infected spots will be overlooked because they are not bleeding. These will begin to bleed later. The trees must, therefore, be examined periodically. A mallet and a broad chisel are the best tools for general use. The long chisel used by Tamil coolies for cutting out red beetle is excellent, and can be used without a mallet.

SCORCHING THE WOUND.

If the torch used to scorch the wound is too large, it will damage the surrounding parts of the stem. A rag wrapped round the end of a stick or iron rod for a length of about two inches is sufficient. It should be dipped in the oil, and then lighted and passed over the cut surface. Kerosine is better than coconut oil. The main object is to dry the cut surface so that the tar will adhere properly. The tar should be applied hot; it waterproofs the wound and prevents decay as well as reinfection. Liquid fuel does not prevent the entrance of fungi and is not permanent. On large estates it would be more economical to scorch the wound with a blowpipe lamp such as is used by painters to remove paint from woodwork. One which burns kerosine should be selected.

NOTES ON SOME SUGGESTED REMEDIES.

Cutting a hole in the tree may diminish the bleeding, but it cannot stop the growth of the fungus : the latter continues to grow without giving so much indication of its presence. It seems to be forgotten that the fungus attacks the tree first and the bleeding is a secondary feature. If the hole is cut through the diseased patch, it provides a better exit for the spores of the fungus : if it is cut through the sound part of the stem, it provides a place where the disease can attack the tree more easily. Either way it is bad.

A bag of kainit hung round the tree has no effect until the kainit dissolves and reaches the ground. Then, it has only a manurial value and might just as well have been applied to the soil at first. A solution of kainit trickling down the stem does not affect the fungus in the slightest degree.

Enquiries made during last year showed that the disease occurs on estates where salt is regularly used as a manure as well as on estates where it is not used. It was impossible to base any recommendations as to the use of salt on the replies to these enquiries.

Finally, it is proposed to cut a hole in the stem near the top on the same side as the bleeding patch and to fill it with salt and camphor in the belief that these will dissolve and find their way inside the stem to the affected part. But the conducting fibres of the coconut stem run spirally from the base to the top, and, supposing that the solution could travel downwards, it would be practically impossible to decide where the hole ought to be cut. Moreover, the internal application of fungicides has never yet been successful.

T. PETCH.

THE COCONUT BLEEDING DISEASE.

Those who have intelligently and systematically tackled the bleeding disease by cutting, burning and tarring are, we are glad to hear, well satisfied with the results, and have generally managed to keep their estates fairly clean. The difficulty has been where the disease has attacked young trees which do not permit of cutting to the same extent as old ones. Mr. Petch, we believe, is now fully satisfied that the disease is infectious, and, therefore, recommends as a preventive measure the application of Bordeaux mixture to the trees—equal parts of sulphate of copper and lime mixed with water to the thickness of paint or whitewash. This can be either applied with a brush or sprayed on. On one estate in the Chilaw district, we hear of a Superintendent noted for his efficiency, having a tank mounted on wheels with a hose attached, which is taken through the estate and with the aid of a pump every tree is thoroughly sprayed with the mixture. The point of attack is almost invariably about 6 or 7 feet from the ground so that if the trees are properly treated for about 10 feet from the ground the chances of attack are small, although, of course, the most effective and surest way of preventing infection is to do the whole tree. So quickly did the news of this preventive measure get about that we understand there is hardly an ounce of sulphate of copper left in Colombo! This is all very well in big gardens, and the intelligent planters may be depended upon to see the work carried out, and we are pleased to hear that inspectors are to be shortly appointed to go round the districts and carry out the work on the small gardens of villagers. This is very satisfactory. The outlook is altogether brighter, but coconut planters are not yet out of the wood, and the most systematic and careful supervision of their properties must be persisted in.

THE COCONUT BLEEDING DISEASE

Feb. 14th.

Dear Sir,—I was very much interested in Mr. T. Carry's letter published in your contemporary of 13th instant regarding the beneficial effects of salt on coconut trees. His opinion regarding the benefits of salt should not be underrated, and I feel sure that planters of experience like Mr. Wright, of Mirigama, Dr. Dias, of Heneratgoda, and Mr. Beven, of Veyangoda, will support him. I also saw an article in the last number of the "Tropical Agriculturist" dealing with the use of salt for agricultural purposes. The price of common salt is of course prohibitive, but the crude salt, kainit, referred to by Mr. Carry, is obtainable for practically one third of the price of common salt, and is quite as efficacious if not more so. I once tried an experiment on one of my plantations by suspending a bag containing 4 lb. of kainit to the most tender branch of a tree which appeared to be badly affected by some disease. The tree was about 6 feet in height, and apparently about 10 years old and had no nuts on it. After some months the tree assumed a healthy appearance, and later on commenced to bear well. I should mention, however, that the property had been somewhat neglected before I purchased it, and that in addition to the above treatment I had the soil turned up round the tree. But I feel no doubt in my own mind that the kainit was principally responsible for the improvement of the tree. I have also found it very useful to sprinkle a little kainit over cattle dung when applied to a tree, and that this prevents the breeding of beetles and other insects that do much harm to a coconut tree.—Yours etc.,

E. O. FELSINGER.

[The use of salt for the coconut palm has been urged at intervals for 40 years back; and our pamphlet calling on Government to allow salt to be denaturalized for this purpose is many years old.—Ed.]

TEA *VERSUS* COCONUTS.

Wilhelms Ruhe, 14th Feb.

DEAR SIR,—It is inconsistent on the part of the upcountry planter to ask for a reduction in rail freight on rice, and in the same breath to urge for the extension of the Railway to Mannar. Especially does it seem the more ungracious when we remember that the tea and rubber industry is already subsidised at the expense of the general community to the tune of nearly a million rupees a year. I may be permitted to add that my father, who imports from Calcutta 2,60) bushels of rice per mensem for our labourers, mostly Sinhalese, stands to gain, like several other natives, a good deal by the proposed reduction of rail freight, as every month 1,000 bushels are sent by rail to Kurunegala.

Till a couple of years ago the upcountry planters, like planters elsewhere, actually made profits on the sale of rice to coolies. Now that profits are not possible owing to the increase in the price of rice, they, instead of increasing the wages of the poor underpaid Tamil immigrant, desire a further subsidy of R900,000 or nearly a million from the general community.

Is the existing subsidy justifiable? Let me quote Sir West Ridgeway (vide Final Review of Administration, page 15.) "Last year (1902) the total value of exports of Ceylon produce was R96,771,467 to which tea contributed R54,300,000 or only 56 per cent." . . . .

"The value of tea exported has risen about 6 per cent. during the years of my administration. Compare with this the increases in other directions. The produce of the coconut palm, shipped to other countries, has increased 86 per cent., cinnamon 90 per cent., while plumbago has advanced over 200 per cent. It is specially gratifying to note a marked increase in the value of the various articles produced from the coconut palm . . . . . . Again while the area under tea cultivation is about 386,000, the area under coconut palm cultivation is estimated to be at least 650,000 acres. (The Blue Book of 1906 however gives the acreage under coconuts as 967,030).

"I have little doubt that, as our communications extend and improve, this industry will make a still more rapid advance."

Let us next turn to the Customs Report for 1906 page A 37—"Of the total value of Ceylon produce exported, the products of the coconut palm represent 21.2 per cent. and tea 56.7 per cent. . . . . . . Plumbago.—The royalty recovered on plumbago amounted to R175,465, quantity exported being 701,845 cwt. valued at R10,457,490." In 1906 63,000 gallons of arrack were exported, yielding a Customs duty of R59,720,

Now if there are any products, which can by any stretch of the imagination be said to be taxed, those are plumbago and arrack, which of course is a product of the coconut palm. I have shown in a previous letter beyond all fear of contradiction that tea, if taxed, is only taxed in the Pickwickian sense.

Further it has become the fashion of late to speak as if coconut planters do not contribute to what is called the revenue.

(1) From Mirigama to Jaffna native planters make use of the railway for the despatch of rice, copra, manure, etc.

(2) Coconut planters will contribute gladly if the Chilaw-Puttalam Railway, for which they have been longing for years, is sanctioned.

(3) Labourers on coconut estates, except in a couple of provinces like the Eastern, eat imported rice.

(4) Through arrack Government has derived millions annually, the figures for 1906 being R4,179,962.

(5) No coconut planter, I think, will object to a tax on copra and so forth, provided Government give to the coconut districts Hospitals on similar conditions, as those so generously lavished on tea rubber districts.

Indeed for the only two hospitals in the coconut districts—Marawila and Panadura—the people are indebted, in addition to the one being built at Moratuwa and other princely benefactions to the De Soysa family.

Now the value of the products of the coconut palm cannot be gauged by exports alone; the latter does not represent more than one half at the outset, for the local consumption is very great. According to the Blue Book of 1906 the crop of coconuts for the Island is estimated at nearly one thousand six hundred million nuts, and the produce of the coconut palm exported is valued at R23,000,000. Perhaps the former is too sanguine; let us take the crop to be 1,000,000,000 which I think is fair. Then of the latter, half represents R23,000,000 and the other at R40 a thousand (a moderate estimate) R20,000,000———coconuts for eating (curries), coconut oil for lights and culinary purposes etc.——which brings the total to R43,000,000.

Again the arrack manufactured in 1896-7, excluding that exported, was over a million gallons (*vide* Mr. Ellis' report on arrack 1897). Taking the amount to be the same now and valuing arrack not at R280, the current market rate, but at R150 a leaguer, value at distillery, we get a further R1,000,000 making a grand total of R44,000,000—the real value of the total products of the coconut palm, excluding toddy, jaggery, etc.

For 1906 the value of the tea trade can be reckoned at R61,000,000. Nor can there be much doubt that tea is the leading industry at present as it has been in the past since coffee. But if you put the coconut, plumbago and cinnamon industries together, you find that the principal native industries are likely in the near future to run tea and rubber very close.

Moreover the former are mainly owned and worked by local proprietors and local labour, whereas the latter are controlled by foreign capital and foreign labour mainly, where profits naturally go out of the island—perhaps to contribute to taxes elsewhere.

No doubt, in days gone by, there was ample justification for subsidy, but if justifiable now, native industries like coconut, plumbago and cinnamon ought to be subsidised proportionately, for the permanent prosperity and credit of this Island must depend as much on coconut, plumbago and cinnamon as on tea, rubber, and cocoa.

It is fair to Government to state that the paddy cultivator is subsidised as much as the tea-rubber planter.

Again, unlike the good old days of coffee, the company—whose interest is confined to the dividend—is fast superseding the proprietary upcountry planter, so that the genuine colonist, outside the public service and church, is fast disappearing.

According to the usual method of calculating commercial undertakings, the profit earned by the railway for the last ten years is 6 per cent. per annum. Therefore, no reduction in rail freight is ever likely to be conceded by any Secretary of State. This assumes that Sir Henry McCallum would favour the reduction (a rash assumption). What really ought to be abolished are tolls, which are a restraint on trade and will benefit the general community, together with the Poll Tax, which is iniquitous in its incidence, and in their place substituted, what Mr. Bowle Evans with such transparent honesty proposes, an income tax. In Ceylon the poor are taxed for the benefit of the rich, both Europeans and native. In England it is just the reverse.—Yours faithfully,

F. J. DE MEL.

PADDY GROWING AND BONE-MANURE

SIR,—I have been experimenting in paddy culture for two or three years. Last year, as I was having my field sown for the second crop, one of the principal ryots of the place said to me :—"Sir, I would advise you not to plant the second crop. If you do, next year your yield will be small." I planted and reaped my second crop and this year planted again. My yield this year was an average of 2,692 lb. per acre. This includes two kinds of paddy, one a black paddy and the other a golden. The rice of one is red and of the other white. The white was planted on 1 acre and 45 cents of land, of which about 25 cents was wholly destroyed by disease, which struck the crop after it had come out in head. This acre and 25 cents gave me 4,600 lb. of paddy, or an average of 3,066 lb. per acre. The straw on this plot of ground stood 5ft. 10 inches high in most parts. The only fertiliser used was bone meal. I used 224 lb. per acre. I would advise my ryot friends to try the above fertiliser. I am not interested in the sale of this manure, but I am interested in the agricultural advancement of the country.

Allur. W. S. DAVIS.

—*M. Mail*, Feb. 17.

ORANGE-GROWING IN CEYLON.

SIR,—It is about seven years ago since I got several oranges, lemons, &c., from Mr. Pearson. Wherever they were given a fair chance, they have done exceedingly well. Lemons, especially, however, have a tendency to overcrop themselves and judicious thinning is necessary. Drought is also responsible for diminished size of fruit and toughness of skin. I find the naval orange a shy flowerer, but get enormous fruits. My own largest are 11 to 15½ oz., but a neighbour has them up to 22 oz. Ignorance and neglect are mainly responsible for failures in orange cultivation. Manure should be applied in a circle round the outside spread of the branches. To force a blossom bare the roots for 3 days in hot sun in dry weather. When the blossom is about to open but is checked by drought, water by the bucketful close to the stem, then cover up. Manure while crop is ripening. Thin out fruit judiciously, 4 lb. artificial per tree twice per annum. After crop prune all leafless twigs. Thin out excess new wood.

Diseases.—Aphis or black bug.—Use kerosene oil and soap emulsion.

Moss and Lichen.—Use lime wash.

There is a nasty borer which attacks the fruit. I know no remedy for this except to pull off and burn all diseased fruit. Never leave windfalls to go mouldy on the ground.

CITRUS.